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Filming a Huge Air Picture—

Robert Taylor gets a lesson in blind-flying in the Link Orientator at Randolph Field—a safe and sane method. Director Richard Rosson, in leather jacket near camera, directs the action.

by
EDWARD B. COPE

A CREAM-COLORED Bellanca cabin plane skimmed over the West Point of the Air and settled down on Randolph Field, Texas. Hundreds of civilian and army spectators rushed out to greet the pilot. The cabin door opened and the crowd cheered.

It was Wallace Beery!

The 200-pound movie actor, who is a lieutenant-commander in the Reserve Naval Air Service, stepped lightly to the ground.

"Where's your Navy uniform, Mr. Beery?" someone asked.

"I'm too smart to land at an Army airport in a Navy uniform," he laughs.

And that incident marked the event when the harbinger of the Metro-Goldwyn-Mayer company swooped down on Randolph Field to film the mighty aerial spectacle, "The West Point of the Air."

* * *

WITHIN two days after Beery alighted at the $12,000,000 Army flying field, fifty Hollywoodites with ten tons of equipment were on location, working like mad. (That being an old Hollywood custom.) Among the personnel were Maureen O'Sullivan, Lewis Stone, Robert Young and Director Dick Rosson.

Included in the tons of equipment was a giant generator for the lighting system to provide sufficient electricity to illuminate the entire 2,300-acre field. Another unit of the technical production equipment was a portable sound-recording system. With this system, Jim Brock and Ted Raymond, sound engineers, recorded 40,000 feet of airplane noises to be "dubbed" to air footage at the California studio.

In air shots, sound and image must be recorded separately inasmuch as sound apparatus on the ground is not sufficiently sensitive to pick up the sounds of ships in the sky. Accordingly, Brock and Raymond obtained sounds of all types of airplane-motor noises in every kind of performance, including taxiing, taking off, zooming, looping, banking, and power diving. These sounds were fitted to appropriate scenes in the studio's film-editing room.

The motion picture industry's two most famous aerial photographers, Charles Marshall and Harold Perry, shot the majority of the formation-flight scenes in "The West Point of the Air." Joseph Valentine, who is considered tops when it comes to photographing women, also was among the eight camera units shooting pictures of cadet officers and airplanes.

"That," commented Jeff Davis, San Antonio newspaper columnist, "is just another example of the customary movie practicality!"

In California, studio equipment has the right of way. Sets are thrown together. Then noisily torn down. Then thrown together again. Tons of equipment are slammed around in the hurly-burly of Hollywood. But this condition did not prevail at Randolph Field.

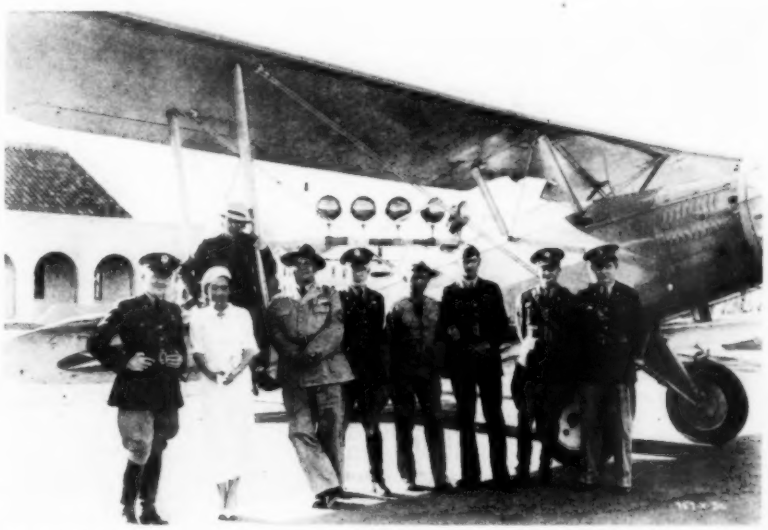
You see, M.-G.-M.'s contract with the government provided that no Federal property was to be damaged in any way. Then, there was to be no interruption of the Army personnel by undue noise or disturbance. (So the yes-men just nodded their heads.) On top

Wallace Beery, alias "Big Mike" gives a little hangar flying instruction to a group of cadets—Robert Young, Henry Wadsworth and Russell Hardie. Camera at left and microphone over Beery's head.

in the Field and Studios

IN THIS article, the author exposes all of the mechanical and photographic tricks-of-the-trade employed in the production of a big film play. In particular, the story tells how the picture, "The West Point of the Air" was produced at Randolph Field, the primary training school of the U. S. Army Air Corps.

And in this story, the admirers of Wallace Beery, a transport pilot and officer in the navy, will get some new dope on their film hero.



Principals in the cast lined up before starting out on the day's work. LEFT TO RIGHT: Major Harms, Randolph Field Officer; Maureen O'Sullivan, Director Richard Rosson (sitting on wing), Wallace Beery, Lewis Stone, Captain Auby Strickland, Lieutenant Luke Smith, Robert Young and Russell Hardie.

of all this there was the little item of a $100,000 cash bond.

So Director Rosson impressed upon his "grips" not to leave a scratch on any of Uncle Sam's highly polished floors. Literal and figurative kid gloves were much in evidence. In the School of Aviation Medicine, the technicians wore tennis shoes and all equipment, even the 400-pound sound cameras, were moved on straining, indignant shoulders.

* * *

IT WAS in this same School of Aviation Medicine that five "student officers"—Robert Young, Russell Hardie, Henry Wadsworth, Robert Livingston and Robert Taylor—were put through the mill, where all recruits are examined by the use of a number of instruments, devices, and gadgets.

As the cameras whirred, the five young actors were put through their paces. They were spun in an electrical whirling chair and then put under their own power. None was able to walk the designated chalkline. In fact, several fell flat on the floor when they tried to stand up.

On the insistence of an Army medical officer, Beery was placed in the chair to determine whether the Navy aviator "could take it." He could and did.

But the real martyr of the day was Bob Livingston. The director had great difficulty in getting a satisfactory picture of Livingston in the whirling chair. As a result, he was twirled intermittently for more than an hour. When the cameramen finally got a satisfactory shot, Livingston was a wreck. He flopped on an Army cot and didn't move for an hour.

* * *

CLOUD formations played an extremely important part in the filming of the flying sequences of the picture that Hollywood will probably call "colossal."

When the sky was the desired shade of blue and had the requisite number of feather-like clouds, the movie company would take to the air. And not one minute before! On days when conditions were just so, hundreds of Army craft would drone over the largest flying center in the world.

Perhaps the most outstanding formation was thirty-six planes, flying in the letters "U. S. A." That sequence will most likely be used in the last few minutes of "The West Point of the Air," when an aerial review is supposed to be in progress.

One day, during the three weeks M.-G.-M. was on location, the director had everything arranged for a plane to make a bad landing and go over on its back. The cameras were set up—"Monkied" with—Taken down—Moved—Set up again. The director signaled the stunt flyer that everything was okay.

The crate came bounding all over the field making "porpoise" landings but could not wham over. Such flop-overs, according to William F. Salathe, Army aviation editor of a San Antonio newspaper, "happen quite frequently in flight training" without even the student pilot's half trying.

Another scene in the picture was the depicting of a student's overturning a training plane after striking a hay stack in an emergency landing field near the Air Corps Primary Flying School. To be sure of the desired after-effect, Rosson had the plane placed on its back with a crane. Several of the spectacular mishaps, which will be flashed on screens all over the world were made in miniature. The risk,

A spectacular formation flight over the Administration Building, Randolph Field. A formation of 36 planes spells out the letters: "U. S. A."

studio officials sighed, was too great for the flyer.

But one stunt that was *not* a fake was a land-plane dipping its wing tips alternately in the Guadalupe River, as the flyer skimmed over the surface.

While on this river location, the company shot scenes of ground troops and Air Corps pilots in peace-time war maneuvers. The sequence called for the construction of a pontoon bridge with anti-aircraft guns, tanks, scattered ground activities, and marching troops taking part. In all, 32,000 feet of film was shot here; less than a thousand feet of it will be used.

* * *

IN ONE part of the $600,000 air epic, Beery, as a hard-boiled instructor, gave a hangar lesson in flying to a group of cadets. In this sequence Beery climbed into the rear cockpit of a plane and ordered one of the cadets into the front seat. Beery then began explaining what makes the ship fly and how it is operated.

Being an experienced flyer himself, Beery was perfectly at home in this shot. As the scene was repeated seven or eight times, the hefty movie star seldom repeated the same lines; he "ad-libbed" with the natural ease of a real flying instructor.

When the scene was completed and the day's work ended, hundreds of Beery's admirers surged around him demanding autographs. He obliged until he was blue in the face. A friend of his spirited him away from the clamoring mob to the peace and quiet of the Officer's Club.

But even that move didn't give the actor any relief. For the small daughter of an officer was waiting for him, with her pen and signature book in hand. She approached Beery for an autograph.

"I'll tell you what I'll do, young lady," the Californian said, not wanting to hurt the child's feelings; "I'll sign your autograph book if you'll show me who else has signed it for you."

Beery presumed the book contained the signatures of a few of the child's girl chums. She quickly thumbed through her book; the first names Beery's eyes fell on were those of Secretary of War Dern, General Danforth, Wiley Post and General Pershing!

* * *

WALLACE BEERY, who holds a transport pilot's license in addition to his Navy reserve commission, is "sold" on private flying. He explained that he had recently ordered a new Bellanca, equipped with flaps for landing in short fields. His new plane will have a cruising range sufficiently great so that he will only have to make two stops on a flight from California to New York.

When the location shots for "The West Point of the Air" were completed, Beery dipped his wings in a reluctant good-by to San Antonio, then flew straight to the United Airport in Los Angeles, where he keeps his plane.

Taking an actual flight picture of a training plane flying over a line-up of 80 U.S. planes at Randolph Field. The cameras are on the elevated platform at the right, only slightly below the plane.

THE complete screen story told in "The West Point of the Air" was written by Lieutenant Commander Wead, retired, who has worked on many movie stories, A. J. Beckhard and Harold Buckley. After several rewritings, in order that it would meet the approval of the United States War Department, the air epic tells the following tale:

Sergeant "Big Mike" Stone (Beery) is one of the best flying instructors at Randolph Field, while his son, "Little Mike" (Young), is a football hero during his attendance at West Point. Little Mike and Skip Carter (Miss O'Sullivan), childhood sweethearts, are practically engaged, much to the joy of Brother Phil Carter and General Carter (Lewis Stone).

Because of his football prowess and his popularity, Little Mike is very conceited. Then vampish Dare Marshall, a discontented society matron, becomes interested in him.

After being graduated at West Point, Phil, Little Mike, and their three best friends are sent to Randolph Field for their training. Little Mike shows great ability and promises to be one of the best flyers in the Army. One of the boys has to leave because of his lack of nerve.

A close-up of Wallace Beery who is a transport pilot and a Lieutenant Commander in the Reserve National Air Service. A real aviation fan.

The crucial day is when the boys must solo for sixty hours in order to earn their wings. On the day before Little Mike is to take his test, he asks Skip to go out with him. She refuses, saying that he needs his rest. He is still too cocky to take advice, and he becomes angry. It is just at this juncture that Dare arrives. She has taken a house near the flying field, and Mike goes with her and spends the night at her house.

They return to the field in her car on the following morning. Phil is taking his test, and he fails to see the car until it is too late. To avoid hitting it, he cracks up his ship. As a result of the accident, he loses a leg. Then another of Mike's fiends has a crack-up, and this young man is burned to death in his plane.

Little Mike loses his nerve, and is afraid to go up. His father practically forces him to go, and when Little Mike is taking off, he flies too low over the hangar and loses his landing gear. Big Mike sees this and has a pilot take him up and drop him into his son's ship. There he tells Little Mike to glide to the ground.

Little Mike hasn't enough nerve to do this, so his father successfully brings the ship down. Little Mike tells his father that he is through with the Army and flying. In order to shut the boy up so that the officers won't hear him, Big Mike knocks him out. For striking a superior officer, the sergeant is court-martialed, and dishonorably dismissed from the Army.

Big Mike takes a job with a cheap commercial flying company, and it is there that Little Mike comes to see him and make his peace. He tells his father that he knows that he (Little Mike) is yellow and can't fly, so he is leaving the Army and going East with Dare, who is getting a divorce. Big Mike

(*Concluded on page* 60)

The Story of Bellanca Planes

by ROBERT H. RANKIN

Bellanca, an early pioneer in aviation, is one of the most picturesque figures in the industry to which he has made many contributions. He is noted as being one of the outstanding aeronautical engineers in this country.

DURING the early summer of 1927, a plane designed and built by G. M. Bellanca, then a member of the engineering staff of the Wright Aeronautical Corporation, flew non-stop from Roosevelt Field, New York to Eisleben, Germany. Since that time, planes built by that engineer have set up a series of world records and have caused him to be recognized as one of the world's foremost aerodynamists and aircraft manufacturers.

Like Igor Sikorsky, Mr. Bellanca received a thorough academic training in engineering. Born at Sciacca, Italy, on March 19, 1886, he professed a marked interest in engineering, and after his general schooling, he entered the Instituto Tecnico in Milan. Receiving his teacher's certificate in mathematics at this school, he entered the Politecnico, also at Milan, where he received his degree in engineering and mathematics.

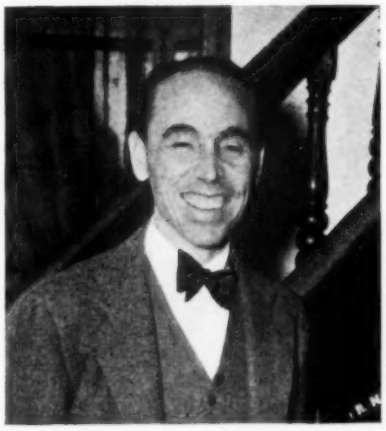
In 1907, Mr. Bellanca started in aviation by publishing aeronautical articles in French and Italian technical magazines. Following this, he designed and built a tractor biplane and a single-seated parasol monoplane, both of which gave exceptionally good performances. In 1911, Bellanca came to the United States, and in 1912 he opened the Bellanca Airplane School at Mineola, Long Island, New York.

In 1916 he closed his school and in 1917 he became construction engineer for the Maryland Pressed Steel Company, in which capacity he served until 1920. At Hagerstown, Md., in connection with this concern, he designed and manufactured the Bellanca CD and CE tractor biplanes. Next, he built the CF, a five-seater cabin plane which set a new record in payload lifting over a number of competing foreign planes. The years between 1922 and 1927 saw Bellanca's machines carrying off the major honors in efficiency flying.

From 1923 to 1926, Mr. Bellanca was construction engineer for the Wright Aeronautical Corporation at Paterson, N. J. In 1925 he built the six-seater Wright-Bellanca cabin monoplane. This plane, which was later named the "Columbia" made aviation history when, in 1927, Chamberlin flew it non-stop to Germany.

This machine is truly the airplane which has made many flyers famous. In 1926, a year after it was built, it won *all* efficiency contests in the National Air Races and in 1927, just before its Trans-Atlantic flight, it set a non-refueling record of 51 hours, 30 minutes. From 1928 to 1931 it flew from New York to California; from New York to Havana, Cuba; from New York to Bermuda; and from Toronto, Canada to London, England, via Harbor Grace and the Scilly Isles. This is quite an excellent service record for any plane to have.

By 1928, the Wright Aeronautical Corporation was specializing in the manufacture of engines alone, and Bellanca left their staff to form a company to produce planes of his design. The Bellanca Aircraft Corporation was formed and the plant was located at New Castle, Delaware.



Guiseppe Bellanca as he appeared after a recent trip to Europe.

The CH commercial cabin monoplane was now brought out and it won the transport and efficiency races in the 1928 **National Air Races.** This was the fourth time Bellanca's planes participated in these races, and it marked the fourth time his planes won them.

The design of the Bellanca J was now developed and the plane won the American Endurance Record. After it, the following planes were designed and developed:

The Pacemaker—Six place cabin monoplane equipped with a 300 H.P. Wright Whirlwind engine. This plane was designed to be used as a landplane or seaplane.

The Skyrocket—Six place cabin monoplane powered with a 420 H.P. Pratt & Whitney Wasp "C" engine. This plane was similar in design to the Pacemaker, but it had more speed and a faster climb.

The Airbus—Twelve place single-engine transport plane equipped with a 600 H.P. Curtiss-Wright "Conqueror" or a 575 H.P. Wright "Cyclone" engine.

Bellanca J-2—A special design equipped with a Packard-Diesel engine. This plane piloted by Fred Brossi and Walter E. Lees set a World's Non-Refueling Endurance Record of 84 hours and 33 minutes.

The Aircruiser—Fifteen place transport monoplane powered with a 650 H.P. Wright "Cyclone" engine.

The Senior Pacemaker—Redesigned and improved Pacemaker model, powered with a 420 H.P. Wright Whirlwind or a 400 H.P. P&W Wasp Jr.

The Senior Skyrocket—Six place improved Skyrocket model, equipped with a 450 H.P. or a 525 H.P. Pratt & Whitney Wasp engine.

Bellanca also designed the "Roma," a large plane built for a New York to Rome flight, and the special Bellanca J-300. This last named ship was powered with a Wright J-6, and was designed for non-stop long-distance flying.

In addition to having won laurels for endurance and efficiency flying, planes of the Bellanca design have made *six* successful Trans-Atlantic flights, as follows:

Roosevelt Field, L. I. to Eislenben, Germany, a distance of 3,911 miles. June 4-6, 1927.

Old Orchard Beach, Maine to Santander, Spain, a distance of 3,400 miles. July 9-10, 1929.

Harbor Grace, Newfoundland to Scilly Isles, England, a distance of 2,650 miles. October 10, 1930.

Harbor Grace, N. F. to Krefeld, Germany, June 25-26, 1931.

Floyd Bennett Field, New York to Cardigan, Wales, a distance of 3,150 miles. July 29-30, 1931.

Floyd Bennett Field, N. Y. to Istanbul, Turkey, a distance of 5,014 miles. July 30-31, 1931.

A Bellanca plane was also the first to ever make a Trans-Pacific flight. (Samishiro Beach, Japan to Wenatchee, Washington.)

In the field of commercial transportation, these planes have demonstrated their ability to carry twice the payload of any other single-engine transport of similar horsepower, at a cost much lower than that of multi-motored planes of similar load capacity.

Besides his activity as a designer, Bellanca is the inventor of an adjustable stabilizer, of a detachable turnbuckle, and of a number of safety devices for aircraft.

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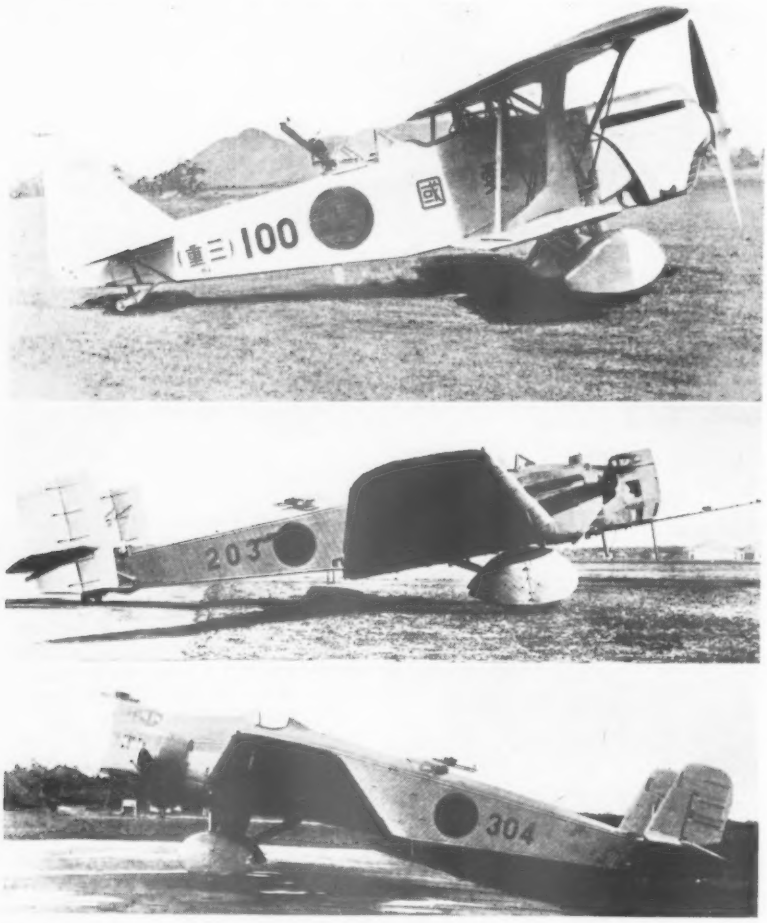
Japan Adds Three More Bombers to Her Service



These are the latest additions to Japan's Air Force, three new bomber types that have claim to high performance.

THE first tangible result of Japan's Air Defense Demonstration is the addition of the three new types of bombers shown in the accompanying photographs.

The top photo shows a light bombing plane with a single 700 h.p. water-cooled engine which carries three tons of explosives and flies at 156 m.p.h. The biplane construction is quite interesting because of the unusual placement of the flying stays and the strut.

The bomber shown by the center photograph is a heavy long-range type equipped with two 700 h.p. engines of the water-cooled type which is estimated at 132 miles per hour. It has a carrying capacity of eight tons of explosives and carries a full complement of machine-guns. It will be noted that the monoplane wing has an unusual degree of dihedral, even for a low-wing type.

The lower photograph shows a twin-motored light bomber equipped with Jupiter engines. It develops 150 m.p.h. and carries 4.5 tons of bombs.

Radio's Claim to Aviation

by ARTHUR J. PERRY

RADIO, hardly known at the beginning of the war, is now become of prime importance to aviation, both in military and civil flying.

Formerly, radio was simply used for transmission of intelligence by voice and by code. It carried information from the ground to the flying plane and from the plane to the ground and for a long time, this was believed to be the limit to radio's usefulness. But, as we have witnessed during the past three years, radio is now taking a prominent and dominating position in the navigation of aircraft.

Two-Row Engines

by CHARLES H. CHATFIELD

THE development of the two-row radial engine, as a power plant for airplanes, goes back to the period before the World War when Anzani and several other engine builders worked on small engines of that type. Soon after the War, Armstrong-Siddeley in England took up the manufacture of the two-row radial engine, beginning with engines of moderate powers and going on in recent years to large ones. In 1928, Curtiss Aeroplane & Motor Company, Inc., brought out a small six-cylinder two-row radial engine which enjoyed a period of quite extensive commercial use.

Some six years ago, the Pratt & Whitney Aircraft Company, realizing that for engines of high power more than nine cylinders were necessary, built an experimental 14-cylinder two-row engine with a piston displacement of about 2,300 cubic inches. The results of dynamometer and flight tests of this engine in 1929 and 1930 encouraged the company to undertake the general development of the two-row type, but since none of the American airplanes built or contemplated at that time required so large an engine, the experience gained with this engine was utilized in the development of a two-row engine of 1,830 cubic inches, the Twin Wasp.

In the latter part of 1930, the Bureau of Aeronautics of the United States Navy Department became interested in the two-row type, and, at the request of the Bureau, the Pratt & Whitney Aircraft Company and others began work on smaller two-row engines, with displacements of about 1,520 cubic inches. In 1934, the developments of Pratt & Whitney had reached the stage where both the Twin Wasp engine and the smaller one, the Twin Wasp Junior, were put into production.

A number of these engines are already in service, and more are to be installed in new airplanes that will appear this year. The present, therefore, appears to be an opportune moment for considering the possibility that in the field of higher powers the two-row radial engine will supersede the single-row type.

Of the two Pratt & Whitney two-row engines now in production, the smaller, the Twin Wasp Junior, has a displacement of 1,535 cubic inches, and, as already mentioned, the larger, the Twin Wasp, is of 1,830 cubic inches. Both engines have 14 cylinders arranged in two staggered rows of 7 each. In general design, these engines are much alike, and, except for differences in crankshafts, master connecting rods and cam mechanisms, they are of the same general construction

(*Continued on page* 58)

Future Trans-Oceanic Traffic

by LIEUT. H. B. MILLER, U. S. Navy

It is interesting to note that the author of this excellent article was one of the officers on board the "Macon" at the time that she took her plunge into the ocean. He gives testimony to the fact that the water is cold off the California coast in a recent letter to our office.

NEARLY every major country in the world today is striving desperately to initiate a trans-oceanic aviation service. Their designers are working over hours. Their engine builders are working far into the night. All of this to secure the prestige which goes to the pioneer.

Much publicity has been given the proposed trans-Atlantic flights of the new Zeppelin, LZ-129. It is well known that the United States Navy's airship facilities at both Miami and Lakehurst are to be made available to this new mistress of the sky in order that the North Atlantic Service may have a fair opportunity to prove itself. Moreover, the Zeppelin company will continue their flights to South America with the faithful Graf, this service to be supplemented with mailplanes which are refueled from station ships lying in the mid-south Atlantic.

The French have only recently launched their giant seaplane with a passenger capacity of seventy-two. A two-deck affair, this aircraft will have both first and second class passenger accommodations. This monster will be used to compete with the Germans in the South American trade.

Our own international airline, Pan-American, has not been caught napping and for several years has been carrying on an intensive study of routes in both the Atlantic and Pacific. Ground arrangements have already been made and the final surveys are completed. Special pilots have studied and re-studied the routes for the past year. The navigation problems have been worked out. Nothing has been left to chance. Even the planes, the new record-breaking Sikorskys and the newer Martin flying boats have taken the air and one has successfully taken the long over-water hop to Hawaii.

The trans-Pacific Clipper ship of the "Pan-Am" flying before a bank of clouds on her long journey, to and from Hawaii.

In the Atlantic, refueling stops will be made at Bermuda and the Azore Islands, while it is probable that a stop will be made on the coast of Portugal proceeding north to England. The western terminus will depend upon the season; in the winter Miami will be the base while in the summer the flight will begin further north at Charleston or Norfolk.

In the Pacific, Pan-American will have natural stepping stones formed by the islands of Hawaii, Midway, Guam, and the city of Manila before reaching China. The San Francisco Bay region will be the natural destination on the Mainland because it is closer to Hawaii.

A close-up of the Pan-American Clipper that flew a two-way flight between the United States and Hawaii. This was a marvellous flight directed by radio and held in trim by a robot pilot.

The one country which has kept its aerial plans to itself has been England. It is not reasonable to expect Britannia to sit idly by while the rest of the world removes days from an otherwise long and arduous sea voyage. As was to be expected, England has been going quietly about her business and from the drawing boards of the famous airplane builders, Short Brothers, has come the fantastic device known as the "composite airplane." Under the direction of Major R. H. Mayo, this craft is in the final stages of its construction, and will soon make its appearance before the testing board.

As evidenced by the De Haviland "Comet," English designers do not hesitate to increase the performance of their aircraft by increasing the wing loading. Thus, the design of this weird craft provides the necessary fuel for the trans-Atlantic flight by overloading the plane. On floats the take-off speed of the composite plane would doubtless be well above one hundred miles per hour. Neither is this take-off speed feasible with a landplane on the landing fields that are now available. In any event, such speeds are impractical for commercial aviation.

It, therefore, becomes necessary to launch this high-speed cargo aircraft in some medium which offers the safety denied by land and water. The air itself provides the answer, and Major Mayo plans to mount his swift airplane upon a large flying-boat which will be very lightly loaded with fuel.

The flying-boat will be under-loaded

while the transport plane will be highly overloaded. The power of the combined powerplants, however, will enable the composite craft to take the air. At an altitude of several thousand feet, the flying boat will increase its speed by a dive until flying speed for the cargo plane is reached.

At this time, the pilot of the speed plane will manually release his craft and lay his course for New York. If there is any question about the endurance of the transport craft, it is conceivable that the mother-plane might carry its smaller brother several hundred miles towards its destination before releasing it to continue its flight alone.

At the conclsion of the flight, sufficient fuel will have been burned to enable the craft to land at a reasonably safe speed. However, the hazards facing the pilot of the transport are many. Engine failure would necessitate a forced landing in the Atlantic Ocean which is rough at best. The high landing speed would make such an experience decidedly risky even though dump valves were provided in the fuel tanks. And, it is questionable how seaworthy the plane could be made when the designer is forced to eliminate every ounce of excess weight.

A ground and launching crew would have to be maintained at each end of the route but the necessary equipment would be relatively small and inexpensive.

As in other inventions and developments, we often find that "there is nothing new under the sun." During the World War the British made every effort to intercept the Zeppelins out over the North Sea because at that stage of their flight they were generally flying low to escape the prevailing westerly winds and also the airships still had a heavy fuel load. Moreover, daylight would be available to assist in the search. However, the large flying boats which could safely fly far to sea were too clumsy to attack a well-armed airship, even had they been able to climb to the invader's altitude.

Interior of pilot's cabin in the Clipper ship. Capt. E. C. Musick (left) and 1st Officer R. O. D. Sullivan. The robot pilot is overhead.

William S. Grooch, Operations Manager, who conducted much of the Exploration, routing and airbase establishment for the Pan American trans-Pacific aerial transport service.

Commander John Porte, R. N., commanding the Experimental Station at Felixstowe, called in Squadron Commander J. D. Rennie who was just as ingenious then as he is now as float designer for the Blackburn Aeroplane and Motor Company, builder of racing seaplanes. As a result of this conference, a huge Felixstowe flying boat powered with two Rolls-Royce "Eagle" Engines was equipped with special wing fittings.

On the center section of the upper wing was placed a Bristol Bullet fighting plane. It was planned that the flying boat cruise around in the North Sea upon receipt of Zeppelin activities. Upon sighting the airship, the fighting plane pilot would be launched to the attack, after which he was to land in the water where he would be picked up by the flying boat. His plane, of course, would be sacrificed.

The first launching of the little landplane in flight was successfully carried out by an R. A. F. pilot, Day, who flew ashore and landed on the station airdrome. The experiment, however, was dropped due to other anti-Zeppelin devices which rapidly developed. If the English do carry out this plan in 1935, they will merely be repeating an experiment successfully attempted by their countrymen seventeen years earlier.

All this culminated in the magnificent double trip of the Pan American clipper ship which recently flew from the United States to Hawaii and return, along a radio controlled path. This was, in all essentials, a duplicate to a scheduled airline flight in commercial service that awakened the world, as never before to the possibilities of trans-oceanic commercial traffic.

END.

That Lake Front-Airport

BECAUSE of the National interest in the proposed lake front airport for Chicago's front yard and the many suggested ideas pertaining to the construction of same, ten of the leading aviation officials in Chicago, as well as several of the older airline pilots, have been asked to give their honest opinion on the project.

The question asked these men was, "Do you think the lake front airport would be practical?" Their answers follow:

* * *

No. 1 (pilot) "I do not believe Chicago would benefit by having an airport situated on the lake front for the use of commercial aviation. The greatest objection, as I see it, is that planes would be continually flying low over Chicago's loop. Almost any morning or evening the lake front area is foggy.

"Our prevailing wind in this section is almost due West during the summer months, making it necessary for all planes to take off directly toward and over Chicago's loop district. Only one forced landing in this area would cause the people of this city to turn against the spirited public officials responsible for the building of this field."

* * *

No. 2 (Official) "The actual need of a lake-front airport for Chicago has no doubt been magnified by the local press. Personally, I am neither for nor against this project. True, it has some very good possibilities, but I do believe that the appropriation of money for the construction of this field would be better used in the construction of a super-highway connecting the present Municipal airport with the down-town business section.

"The big question at the present time seems to be the saving of time in mail and express delivery to the city's loop after it has once been landed at the Chicago airport."

* * *

No. 3 (Official) Chicago needs an airport on the lake-front. It would not only save much time in the delivery of mail and express but would prove a great convenience for the many passengers passing through Chicago.

Other cities have constructed and operated lake-front airports with great success, and I see no reason why Chicago could not do the same. If we, of this great city, expect to retain the honor of being the country's aeronautical center we should live up to the name and make improvements wherever possible. Chicago's sky-line should be to the air-passenger what the Statue of Liberty is to the immigrant, a tribute of welcome."

* * *

No. 4 (Pilot) "I would like to see Chicago have a lake-front airport, but I do not believe it should be used

(*Continued on page* 60)

Wearers of the D. S. Medals

by CARL B. OGILVIE

Short biographies of our air heroes who won Distinguished Service Medals for heroic action in the World War together with brief descriptions of the citations.

CHARLES JOHN BIDDLE

Residence and born—Andalusia, Pa. General Order No. 60, W.D., 1920. In the region of Damvillers, France, Sept. 26, 1918. Captain, 13th Aero Squadron, Air Service.

DURING an engagement between 11 Spads and 12 enemy Fokkers, Captain Biddle, perceiving a comrade in distress from the attack of two planes, dived upon them and by his fire forced them to withdraw. His prompt action saved the life of his comrade, who was in imminent danger of being shot to the ground.

* * *

HARVEY WEIR COOK

Residence—Anderson, Ind. Born—Wilkinson, Ind. General Order No. 44, W.D., 1919. Near the Bois-de-Dole, France, Aug. 1, 1918. First Lieutenant 94th Aero Squadron, Air Service.

SIGHTING six enemy monoplace planes, at an altitude of 3,500 meters, he attacked them, despite their numerical superiority, shooting down one and driving off the others.

Oak-leaf cluster. For the following act of extraordinary heroism in action near Crepion, France, Oct. 30, 1918, Lieutenant Cook is awarded an oak-leaf cluster, to be worn with the distinguished-service cross: He attacked three enemy biplanes at an altitude of 1,000 meters. After a few minutes of severe fighting his guns jammed, but after clearing the jam he returned to the attack, shot down one of his adversaries in flames and forced the other two to retire to their own lines.

* * *

LANSING C. HOLDEN, JR.

Residence and born—New York, N. Y. General Order No. 46, W.D., 1919. Near Montigny, France, Oct. 23, 1918. First Lieutenant, 95th Aero Squadron, 1st. Pursuit Group, Air Service.

HE was ordered to attack several German balloons reported to be regulating effective artillery fire on our troops. After driving off an enemy plane encountered before reaching the balloons, he soon came upon 5 balloons in ascension 1 kilometer apart.

In attacking the first, which proved to be a decoy with a basket, his gun jammed; after clearing it, he attacked the second balloon, forcing the observer to jump. His gun again jammed before he could set fire to this balloon. Moving on the third balloon at a height of only 50 meters, he set fire to it and compelled the observer to jump. He was prevented from attacking the two remaining balloons by the further jamming of his machine gun.

Oak-leaf cluster: For the following act of extraordinary heroism in action near St. Jean de Buzy, France, Nov. 4, 1918, Lieutenant Holden is awarded an oak-leaf cluster, to be worn with the distinguished service cross:

Flying at a low altitude to evade hostile pursuit patrols, he attacked a German observation balloon in the face of anti-aircraft and machine-gun fire. Although the balloon was being rapidly pulled down, he set fire to it in its nest and also caused much damage to adjacent buildings.

* * *

A rare photograph of the early "Flat-Wing" Nieuport that was the outcome of the little Nieuport sportplane. The gunner bobbed up through a round hole in the upper wing. This plane was entirely unsatisfactory and was soon discontinued. How many of our Photo-Phans have heard of this ship?

GORMAN DE FREEST LARNER

Residence and born—Washington, D. C. General Order No. 145, W.D., 1918. In the region of Champeny, France, Sept. 13, 1918. First Lieutenant, pilot, 103d Aero Squadron, Air Service.

HE attacked an enemy patrol of 6 machines (Fokker type) and fought against odds until he had destroyed 1 and forced the others to retire.

Oak-leaf cluster: A bronze oak-leaf, for extraordinary heroism in action in the region of Montfaucon, France, Oct. 4, 1918. While leading a patrol of 4 monoplanes, he led his patrol in an attack on an enemy formation of 7 planes. By skillfully maneuvering he crushed one of the enemy machines and with the aid of his patrol forced the remainder of the enemy formation to withdraw.

* * *

ROBERT O. LINDSAY

Residence and born—Madison, N. C. General Order No. 46, W.D., 1919. Near Bantheville, France, Oct. 27, 1918. First Lieutenant, 139th Aero Squadron, Air Service.

IN company with two other planes, Lieutenant Lindsay attacked 3 enemy planes (Fokker type) at an altitude of 3,000 meters, and after a sharp fight brought down one of them. While engaged with the 2 remaining machines 8 more planes (Fokker type) came at him from straight ahead. He flew straight through their formation, gained an advantageous position, and brought down another plane before he withdrew from the combat.

* * *

WILLIAM THOMAS PONDER

Residence — Mangum, Oklahoma. Born—Llano, Texas. General Order No. 46, W.D., 1919. Near Fontaines, France, Oct. 23, 1918. First Lieutenant, 103d Aero Squadron, Air Service.

HAVING been separated from his patrol, he observed and went to the assistance of an allied plane which was being attacked by 13 of the enemy. Against great odds Lieutenant Ponder destroyed one enemy plane and so demoralized the remaining that both he and his comrade were able to return to their lines.

* * *

LESLIE J. RUMMELL

Residence and born—Newark, N. J. General Order No. 126, W.D., 1919. In the region of Moirey, France, Sept. 29, 1918. First Lieutenant, 93d Aero Squadron, Air Service.

LIEUTENANT RUMMELL, leading a patrol of 3 planes, sighted an enemy biplane which was protected by 7 machines (Fokker type). Despite the tremendous odds, he led his patrol to the attack and destroyed the Di Nash plane. By his superior maneuvering and leadership 4 more of the enemy planes were destroyed, and the remaining 3 retired.

* * *

KARL J. SCHOEN

Residence and born—Indianapolis, Ind. General Order No. 37, W.D., 1919.

XUM

Near Ancerville, France, Oct. 10, 1918. First Lieutenant, 139th Aero Squadron, Air Service.

WHILE leading a patrol of 3 machines he sighted 9 enemy planes (Fokker type) and immediately attacked them. Although greatly outnumbered, he destroyed one of the planes and put the others to flight. He was killed in action Oct. 29, 1918, and has been officially credited with destroying 7 enemy aircraft.

Posthumously awarded. Medal presented to widow, Mrs. Maurine Estelle Schoen.

* * *

WILLIAM H. STOVALL

Residence and born—Stovall, Mass. General Order No. 145, W.D., 1919. In the region of Etain, France, Sept. 26, 1918. First Lieutenant, pilot, 13th Aero Squadron, Air Service.

WHILE leading a protection patrol over a day bombing formation his patrol became reduced through motor t ouble to himself and one other pilot. When the bombing patrol was attacked by 7 enemy planes he in turn attacked the enemy and destroyed one plane.

* * *

SUMNER SEWALL

Residence and born—Bath, Maine. General Order No. 32, W.D., 1919. Near Menil-la-Tour, France, June 3, 1918 and near Landreset-St. Georges, France, Oct. 18, 1918. First Lieutenant, 95th Aero Squadron, Air Service.

ON June 3, Lieutenant Sewall with 2 other pilots, attacked a formation of 6 hostile planes. Though his companions were forced to withdraw because of jammed guns, he continued in the fight for 15 minutes and succeeded in sending one of his adversaries down in flames.

On Oct. 18, while on a voluntary patrol, he saw an American observation plane being attacked by a German machine (type Fokker), accompanied by 8 other hostile planes. He immediately attacked and destroyed the Fokker and was in turn attacked by the other 8 planes. By skillful maneuvering he evaded them and escorted the observation plane back to our lines.

Oak-leaf cluster: Lieutenant Sewall is also awarded an oak-leaf cluster for the following act of extraordinary heroism in action near Rocourt, France, July 7, 1918: He fearlessly attacked a formation of 5 enemy planes (type Fokker), and separating 1 from the group, pursued it far behind the enemy's lines, and sent it down in a crash, following it to within 30 meters of the ground in spite of severe fire from a machine gun, rifles, and anti-aircraft guns, bullets from which passed through his clothing.

EDITOR'S NOTE: *This is the second article by Mr. Ogilvie on American Air Heroes who have won the Distinguished Service Cross. It is a pleasure to present this list to our readers, telling of men who accomplished their objective and yet who were not entitled to the status of "Ace."*

Roadable 'giro for Air Commerce Bureau

This is an artist's sketch of the proposed roadable Autogiro now being designed for the Bureau of Air Commerce. It is to be at home both on the road and in the air.

A NEW type of autogiro is being produced by the Autogiro Company of America, Willow Grove, Pa., for the Bureau of Air Commerce. One of the most unusual features is a road driving mechanism by which the machine can be driven along the roads like an auto when the propeller is disconnected.

The lifting rotor blades can be quickly folded along the length of the fuselage so that the machine can be housed in a space about seven by twenty-four feet. It can be taxied around like a motor-car under its own power, which makes it easy to house. A single car garage will cover most of the body.

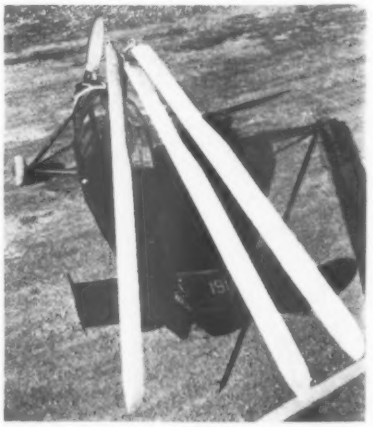
Direct control through the rotor blades, with the elimination of wings, gives complete control with no forward speed. A prototype of the proposed machine, without the road drive mechanism, has been on test for two years and was recently demonstrated in Washington and New York. Some of the design details are not yet worked out as yet and its probable price and time of commercial production are still unknown. The following specifications and performance figures are based on the experimental machine which has already flown about 150 hours:

SPECIFICATIONS

Gross weight	1,350 lbs.
Diameter of rotor blades	34'6"
Overall length	24'0"
Overall width, blades folded	7'0"
Wheel-base	114"
Horsepower (Pobjoy geared engine)	90 h.p.
Maximum speed on land	20-25 m.p.h.
Maximum speed in air	115 m.p.h.

If this machine works out as it should, it will solve many problems for the private flyer in respect to housing space and transport to a suitable take-off and landing space.

As might be anticipated, the designers are against a hard proposition when the design of the road-drive mechanism is tackled, both in the arrangement of the mechanism and in keeping the weight down. This will involve the use of a differential gear, which is a hefty group, and also some sort of geared mechanism between the road wheels and the engine, to say nothing of a clutch. However, the project is not impossible of solution even though it will give some of the engineers a whole lot to think about.



This shows how the rotor blades are folded back.

Early American Aviation

by STELLA RANDOLPH

An amusing and instructive description of an early airline experiment, full of ambition but which fell short of fulfillment. So far as we are aware, this is the first time that this effort has been described in print.

BENJAMIN FRANKLIN, in his Pennsylvania Gazette for June 26, 1766, carried an advertisement which quaintly read:

"BARNHILL'S FLYING-MACHINE

THE FLYING-MACHINE

This is to give notice to the PUBLIC that the FLYING-MACHINE, kept by JOHN BARNHILL, in Elm Street, near Vine Street, Philadelphia; and JOHN MESEREAU, at the Blazing-Star, performs the journey from Philadelphia to New York in two days; and from thence to Philadelphia in two days also; a circumstance greatly to the advantage of the traveler, as there is no water carriage, and frequently nothing to impede the journey. It has already been performed to the general satisfaction of many genteel people. They get off from Philadelphia on Mondays and Thursdays, punctually at Sunrise, and change their passengers at Price Town; and return to Philadelphia and New York the following days; the passengers paying ten shillings to Powle's Hook, opposite to New York, ferriage fee, and three pence each mile and difference between. Gentlemen and ladies who are pleased to favor us with their custom may depend on due attendance and civil usuage, by their humble servants. — John Barnhill and John Mesereau."

This "flying-machine" of Franklin's day is amusing compared with the streamlined speedy automobiles and the modern airplanes of today. If these would be amazing to Franklin and his advertisers, it is even more entertaining to speculate on the feelings of the Seventeenth Congress of the United States who scoffed at the petitions of two early airplane inventors and their claims.

On Monday, March 25, 1822, in the first session of the Seventeenth Congress, Representative Milnor of Pennsylvania presented the following petition:

"James Bennett, a mathematician of the city of Philadelphia, to the honorable the Senate and House of Representatives of the United States of America, in Congress assembled, most respectfully showeth:

"That your petitioner having invented a machine by which a man can fly through the air—can soar to any height—steer in any direction—can start from any place and alight without risk of injury; and whereas a like machine has never been invented in any country or age of the world so as to be applied to purposes of practical utility, and as it is more than probable that artificial flying would not for a thousand years to come, be brought to the same degree of perfection had not your petitioner under Providence accomplished it, and, as it must be evident to all that letters patent would be of little use to the inventor in consequence of various modifications or improvements which might be made, and which never would have been thought of had not the way first been opened by your petitioner; He, therefore, solicits a special act of the Congress of the United States to secure to him and his heirs for the term of forty years, or for such other term as in their wisdom may be deemed just, the right of steering flying machines through that portion of earth's atmosphere which presses on the United States, or so far as their jurisdiction may extend.

"By granting your petitioner's request the honor of the invention shall be conferred on the United States.

"J. Bennett, A. and M.

"Philadelphia, February 13, 1822."

Burlington, June 25, 1766.

Pursuant to an Order of Robert Smith, and Thomas Redman, Esquires, Judges of the Court of Common Pleas for the County of Burlington aforesaid, upon the Petition of John Wrigley, Carpenter, of the said County, with the major Part in Value of his Creditors, Notice is hereby given to all the Creditors of the said John Wrigley, that the fourth Day of July next, being the first Day of the Week, is appointed, by the said Judges, for the said Creditors to meet, at the House of Lambert Barnes, in the City of Burlington, at Two o'Clock in the Afternoon, to shew Cause, if any they have, why the said John Wrigley should not have all his Estate in the Use of all his Creditors, and be entitled to the Benefit of the Act of Assembly of this Province of New-Jersey, for the Relief of insolvent Debtors.

To be SOLD by the Subscriber, on the Tenth of July next, on the Premises, for ready Cash, a Lot of Land, for a Gentleman's Seat, lying in Maidenhead Township, Co. Gloucester, about 6 Miles from Trenton, and 16 from Philadelphia, and has ever since it was 7 Years a settled and flourishing Town, and is now. The said Tract containing between 13 and 14 Acres of good Land, with a large convenient two Story Stone House, with 5 Rooms on a Floor, with 5 Fire Places, and a large Store Kitchen, with a Smoak-house, and a very good Barn, Stables and Sheds, with a large pleasant Garden, and a good Cyder Orchard, fit to make 50 Barrels of Cyder in a Year. Any one applying before the Day of Sale, may know the Terms of

THOMAS CARVELL.

This is to give NOTICE to the PUBLIC, THAT the Flying Machine, kept by John Barnhill, in Elm-Street, near Vine-Street, Philadelphia, and John Mathewes, at the Blazing Star, performs the Journey from Philadelphia to New-York in two Days, and from thence to Philadelphia in two Days alfo; a Circumftance greatly to the Advantage of the Traveller, as there is no Water-carriage, and confequently nothing to impede the Journey. It has already been performed to the general Satisfaction of many genteel People. They fet off from Philadelphia and New-York on Mondays and Thurfdays punctually at Sun-Rife, and change their Paffengers at Prince-Town, and return to Philadelphia and New York the following Days: Paffengers paying Ten Shillings to Prince-Town, and Ten Shillings to Powle's-Hook, oppofite New-York, Ferriage free; and Three Pence each Mile any Diftance between. Gentlemen and Ladies who are pleafed to favour us with their Cuftom, may depend on due Attendance and civil Ufage by their Humble Servants

*6 W. JOHN BARNHILL, and JOHN MATHEWES.

To be Sold by the Subfcriber, living on the Premifes, in the Township of Little Britain, and County of Lancafter, a Plantation of about 220 Acres of Land, with a great Plenty of Meadow Ground; likewife on the Premifes a good Set of Mills, on a good Stream of Water, in good Repair, and well accommodated for Merchant and Country Work. JOSEPH HEWES. 15 W.

A photostatic copy of the original "flying-machine" advertisement.

It is amusing to note that this early inventor did not hold in too high esteem the inventive possibilities of the future generation. Perhaps he felt that a less devout and more reckless age was in the ascendency from whom Providence might deem it prudent to withhold such useful knowledge.

Another interesting feature of this petition is the question of law involved. Does a country own the air or atmosphere above it? Or if not an unlimited amount of that ether, to how great an extent do its claims reach? Is a three-mile limit to be set as for the seas, in international law? These are questions still unsolved, but some regulations will be necessary before many years judging by the present stride of aviation.

Congress was not disposed to waste time on such vagaries, and between the lines may almost be envisaged the very expressions upon the faces of these gentlemen as it was proposed to pass the request on to the judiciary committee, whose chairman promptly and no doubt somewhat tartly informed that his committee did not "undertake to soar into regions so high; the duties of the judiciary committee were nearer the earth." Then perhaps the committee on roads and canals would be saddled with this petition, but they would not, and the petition was finally tabled.

Human nature is ever the same. Any privilege sought by one usually finds more than one claimant. About a week later Representative Keyes, also of Pennsylvania, presented a petition from one David B. Lee of Philadelphia, wherein it was represented that not Bennett but Lee was the rightful claimant for the privilege of flying for forty years in the atmosphere bordering the United States, as the latter was the original inventor.

Then the petitions were referred to a special committee, and appear to have gone the way of many another special committee investigation. Whether a report was ever made, or anything further done about the claims, has not come to light.

Note also in the strong claims made by Bennett in his petition, "can fly through the air, can soar to any height, steer in any direction, can start from any place and alight without risk of injury." Why that's the whole problem of inventors of flying machines today, in a nutshell. Most of them

would give their eyeteeth for such knowledge. What if this man Bennett, or perhaps it was Keyes, or both, had actually come upon, through Providence of course, the secret of "soaring to any height, starting from any place and alighting without risk or injury?" Suppose in some dusty corner of Congressional archives, long forgotten, these papers might yet be available. Or did these men trust all their secrets to Congress?

Is this information somewhere in the hands of descendants of these inventors, carefully guarded, or are these papers utterly forgotten in some musty attic in Philadelphia, or were they perhaps scornfully destroyed as worthless rubbish? These gentlemen may have been right in their belief that not in a thousand years would the flying machine reach the same degree of perfection of action they had discovered. Perhaps the modern inventor might find a key to his problems if he were able to lay his hands upon the drawings and plans of these men.

Lee in his petition, also asked exclusive privileges for balloon flights. Santos Dumont is generally thought of as the first successful flyer of lighter-than-air craft, having won the 100,000 franc prize offered for the first flight around the Eiffel Tower in 1901. Earlier, Santos Dumont flew in a box-like kite powered machine in France, covering the distance of 720 feet in 31 seconds at a height of 20 feet from the ground. But Santos Dumont was not the first man to fly in an airship. First man to fly is the title usually conferred upon Jean Francois Pilatre de Rozier, who went up in a dirigible fire-balloon in October, 1783.

In our own country, C. F. Ritchel of Corry, Pennsylvania, patented an airship which he flew at Hartford in 1878. His success at the time attracted the attention of the New York Herald, which offered to build a large ship for him, but he had assigned his patent rights to one G. H. Hess of Winchester, Virginia, and was not in a position to accept the offer.

And so it goes, all through the history of aviation. Many of the real pioneers have never been awarded their proper share of attention and credit by the press while those who followed years after, have reaped the award both in fame and financially. Some months back, I gave a fully detailed account of one Gustave Whitehead in POPULAR AVIATION, one of the few accounts that have ever been published of this real pioneer.

Why has recognition been withheld from our early American inventors of aircraft, while acclaim and even offers of funds for those from abroad have been freely given? Perhaps the only explanation is that of the pioneer who pointed out that prophets are generally without honor in their own country.

END.

The Laird Sesquiplane LC-EW-450

(*See front cover of June issue*)

ON the front cover of last month's issue of POPULAR AVIATION, Mr. Bollin gave a full colored drawing of the new Laird transport plane recently built in Chicago, but for lack of space at that time, the scale drawings and the description were not published. By request of a number of readers, the plans are shown below.

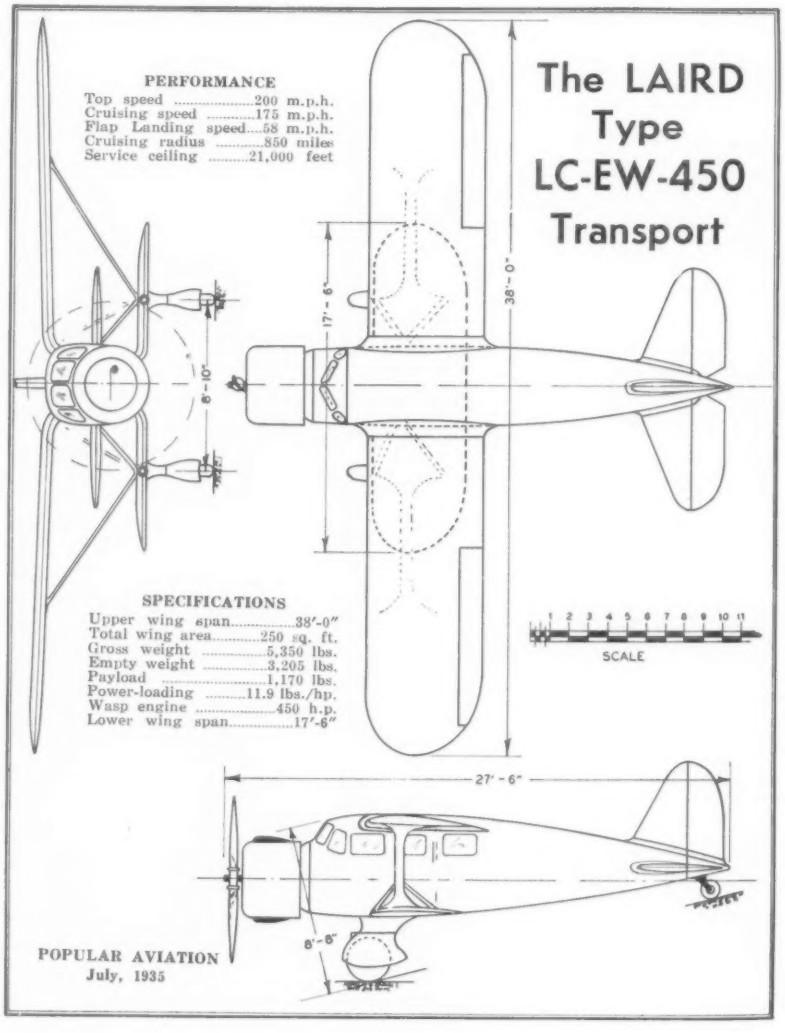
The Laird sesquiplane, Model LC-EW-450 is a single-engined wasp powered 6-place transport plane having excellent performance characteristics. It has a metal fuselage and wings of the wood spar type, differing greatly in this respect for the many all-metal monocoque types that are now in production. The use of wood ring spars, fabric wing covering and tubular metal fuselage construction has been the desire to reduce the cost of manufacture and maintenance.

In the construction of the semi-monocoque fuselage, the aluminum alloys have been employed, 24ST alloy for the outer skin and 17ST the bulkheads. The fuselage skin is in segments running from bulkhead to bulkhead with longitudinal stiffeners for the support of the skin between bulkheads. At the point of wing connection, the main bulkheads are formed of extruded bulb sections with a web riveted between them.

"I" formed spruce spars are employed with the top wing, the spars being reinforced by plywood trussed ribs, while the inner section of the lower wing, between the wing-struts and fuselage is built up of metal tubing. At the panel point where the wing struts connect with the lower wing, a connection is also made for the oleo landing-gear strut in which the upper end of the strut freely slides. The outer sections of the lower wing, past the struts, are of the same general construction as the upper wing.

Ailerons are provided with a thin skin of 24ST metal and are hinged to

(*Concluded on page* 60)



Swan Song of the Liberties

by GORDON SEAR WILLIAMS

The faithful old Liberty engine is to be retired this year after a long period of service. A brief description of the engine and pictures of the many ships on which the engine was installed is given by the author. The illustrations are Official Photos of the U. S. Army Air Corps.

THE famous "Liberty" engine, that helped the Allied Forces gain mastery of the air in the last year of the World War, is to be officially retired this year.

The Materiel Division, Army Air Corps, announced recently that no more of the "Liberty 12", or V-1560's, as they are technically known, are to be overhauled or repaired for re-use in Army aircraft. After more than 17 years of continuous service in Army aviation, this time honored engine will go the way of the Le Rhone, Mercedes and others of the war period.

The story of the "Liberty" is a tale of most remarkable records. Work was first begun on this engine on June 3, 1917, when the preliminary plans were drawn up by E. J. Hall, of Hall-Scott motor fame, and J. G. Vincent, a Packard engineer. On July 3, the first "Liberty" was set up and on August 25 it had completed its first 50 hour test run. Production was immediately started and by November, 1917, engines were beginning to pour from the factories.

Aviation experts throughout the world declared the "Liberty 12" to be without a peer. Samples were sent to the Allied Forces for official testing and were in all cases enthusiastically accepted. Contracts were then let by the Government, late in 1917, with six engine companies, among them being Packard, Marmon and Ford, for 22,500 "Liberty" engines and spares.

By November, 1918, more than 14,000 Liberty engines had been produced by the combined factories of these six companies, and more were being made at a rate of 4,000 engines per month. Up to this time, however, this engine was merely known as the "U. S. Standardized Line", but Admiral Taylor, U. S. N., at an Aircraft Board meeting, called it the "Liberty" engine and the name was generally adopted.

It is the opinion of many officers who served in the War that the Liberty was the outstanding development of the period. The Army Engineering Division continued experiments and developed the 4, 6 and 8 cylinder "Liberty" types as well, these engines to be used (in order) in primary trainers, basic trainers and light pursuit types. The advent of the air-cooled radial-engine of low horsepower rating, curtailed further use of the Baby Liberty types but famous "12" continued in first place as to number in use.

The Navy's "outlawing" of water-cooled engines practically eliminated the Liberty from that branch of aviation, however. As the increase in air-cooled engines became greater, the Engineering Division, not wishing to see the many surplus "Liberty 12's" go to waste, developed a modified Liberty air-cooled in both inverted and upright models.

These engines were used experimentally in the Keystone XLB-3 bomber and the Douglas XA-2 Ground Attack ship, which boasted an armament of 6 machine guns. As the air-cooled version was not generally as successful as the original water-cooled type, production along that line was stopped. At the same time the water-cooled inverted "Liberty" made its appearance as a special adaption for the Loening OA and COA amphibian types.

It was ships of this type that made the Pan-American good-will Flight of 1926. Two years previous, 1924, 2 Douglas Cruisers powered with "Liberty 12's" had pioneered the 'Round World route, thus bringing the record of the first flight to the U. S. Army. The Army's XCO-5A altitude observation plane made a World record ascent in 1926 to the height of 38,704 feet, thus the Liberty engine brought one more record to the United States.

(*Concluded on page* 65)

A Douglas O-2B observation plane powered by a single Liberty 12, 400 h.p.

A Douglas C-1 Army transport powered by a single Liberty 12.

A Douglas O-2H observation plane powered by a single Liberty 12A, 400 h p.

A Douglas O-2K observation plane for the National Guard, powered by a single Liberty 12A.

Keystone Light Bomber XLB-3 powered by two inverted Liberties 12A, of 410 h.p.

Douglas XA-2 Attack Plane with a single inverted Liberty 12, 410 h.p.

Engineering Division Army Trainer TW-1 with a single Liberty 6, of 200 h.p.

Another view of the Douglas O-2K equipped with a single Liberty 12A.

Huff-Deland Light-bomber XLB-5 equipped with two Liberty 12's.

Airplanes in the Gay 90's

by

LEWIS OWEN

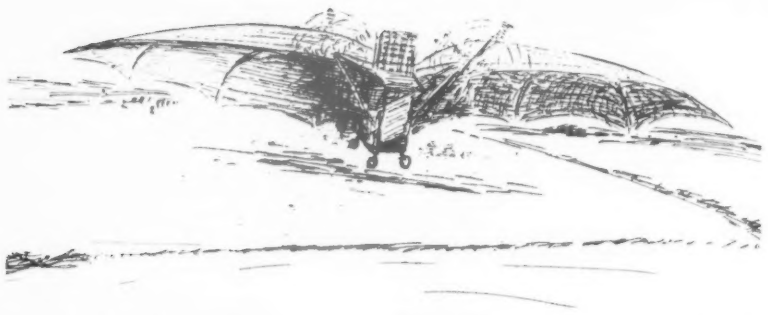


Fig. 1. Here's Ader's steam-driven twin-screw monoplane that carried a man in 1890. Somewhat birdlike in appearance but it proved that flight was possible.

I DON'T want to start any arguments nor keep Mr. Wright from bringing his first airplane back to America, but I think you would be interested to know that the first man-carrying airplane flight for which there are authentic records, was made by the Ader "Avion," in 1890.

Its inventor, Clement Ader, was a European telephone pioneer. (Remind me to tell you, some day, about Dr. Alexander Graham Bell's crazy airplane.) His first attempt at an airplane was in 1872, with a machine of twenty-six foot span, weighing fifty-three pounds. It was an ornithopter, so need I say more?

In 1891, he built, at the slight cost of $120,000, a machine like the one in Fig. 1, with a fifty-four foot span, which weighed 1100 pounds in its stocking feet. It was propelled by two four-bladed tractor screws driven by a twenty-five horsepower steam engine. In spite of everything, it carried a man 164 feet on October 9th, 1890.

On October 14th, 1897, a similar machine made a semicircular flight of 1000 feet at Satary, France. The catch to it was that both machines were wrecked on their first flights. So the Wright Brothers did make the first controlled flight after all.

The purpose of this article is to show that the hackneyed phrase, "There's nothing new under the sun," was never truer than when applied to aviation's sun—may it never grow dim. Even such "recent" developments as the "Arup," the "barrel plane," "paddle-wing" and others, were thought of in the period extending from 1906 to 1913.

Have you been wondering about that clean-cut cantilever biplane depicted in Fig. 2? This was known as the "Coanda Biplane," and was the first plane to be propelled by a turbine instead of a prop. It had a plywood fuselage and four fins like a dart. That was in 1910 and it flew very successfully. I wonder if this would be a solution to the noise problem in airplanes, since most of the noise is caused by the propeller. (*We have been boosting this idea right along.*—ED.)

An idea, to which some attention is being paid, is the convertible auto-airplane. Old stuff! Why, back in 1910, G. H. Loose of Redwood City, Cal., designed, built and flew his "Loose Monoplane." This plane had a twenty-six foot span and weighed 300 pounds without the pilot. The fuselage was an open triangular girder; the elevator was forward and the rudder aft. Rubber sheeting was used for fabric. It was powered by a twenty-five horsepower motor which turned two six-foot tractor screws by means of a cable transmission. Not only did this plane fly, but the wings and props could be folded back and the whole thing driven like a car.

Along the same line was the Supermarine P.B. 7 (Pemberton-Billing). This was an honest-to-goodness flying boat that flew, and was used in the World War. It was thirty-four feet over-all in length and fifty-seven feet in span. It was comparable in many ways with the flying-boats of today in size and everything else. The plane had a dead weight of 3,000 pounds and a useful load of 950 pounds. A 225 H.P. Sunbeam motor gave it a top speed of 70 m.p.h. and a minimum of 45 m.p.h. In case of a forced landing, the wings and aft fuselage could be dropped and it remained as a fine motor launch, which could cruise at thirty-five knots for 200 miles, using the same motor that was used in flying.

When the ill-fated "Akron" was built, among its many "innovations" were the props which could be tilted to help maneuver the airship. This idea is not new. In 1910, a company was formed to build the "Rekar-Preeble" airship, powered by a thirty-five H P. Preeble motor. The ship was to be 250 feet in length, of true streamline form, and was to manufacture its own gas in flight. It was to have four propellers, one at each corner of the single gondola, and these propellers could be tilted at will. The ship was never finished because of financial difficulties—and aren't we all?

The "Macchi-Castoldi" racing seaplane created quite a stir, with its twin props revolving in opposite directions on the same axis. Well, the idea is so old that it became of age several years ago, and it was used on a number of successful machines way back when a "Schneider" was what you called a punk "Skat" player.

The idea was first used on a "Barber Monoplane," 1909, designed by Howard Wright and also on other planes of his design. About the same time, it was tried on a dirigible, make unknown. In this case, the props were driven by a Gnome rotary motor, mounted to revolve in a horizontal plane, so that torque was conspicuous by its absence. It was also used successfully in the "Le Feure and Deperdussin" canard monoplane in 1910.

And, parenthetically and speaking of canards, the Focke-Wolfe Canard of a couple of years back was no advance in design. In the days of aviation's infancy, the canards were more popular than any other type, and with good reason. The canard has it all over the

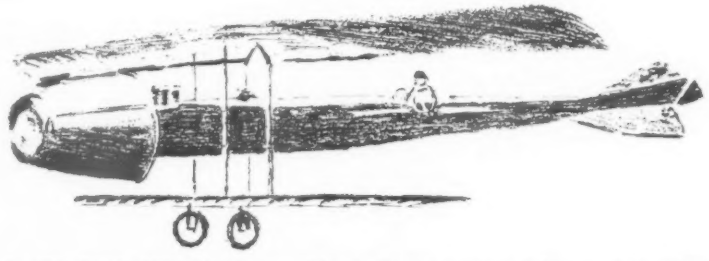


Fig. 2. This Coanda biplane teaches something to the most modern designers. It has cantilever wings and a turbine reactor in place of a propeller. This was built 25 years ago and was successful. The turbine reactor will be the future type of prop.

Look Much Like 1935 Models

MR. OWEN proves, by authentic examples, just what P. A. has always claimed. That is, nothing of a strictly original character has been devised for aviation in many years.

Here we see some of the real old-timers that possessed everything that a modern plane has and in addition, many features that are not known by the Post-Lindbergh contingent. They sure pushed development in the old days and were not content to sit down and endlessly reproduce the same type of structure.

Fig. 3. This is the nifty little Vendome which should be good news to our lightplane enthusiasts. It is in advance of the planes of today because it had a successful wing area adjustment by which the area could be varied.

other types in stability and safety from spins.

We have a lot of good and brave pilots nowadays, no one can deny that. But how many would care to be the first to fly such a plane as the Vendome Monoplane in Fig. 3? This plane, which looks like a baby carriage or a racing sulky was, nevertheless, a very successful type. It had a forty-one foot maximum span and a thirty-nine foot over-all length. As can be seen, there was no fuselage, merely an outrigger on which the horizontal stabilizer and a tiny fin were placed. Powered by a three-cylinder Anzani motor, which developed under fifteen horsepower, it managed to take off at thirty m.p.h. The weight was kept down to 617½ pounds with gas for four hours' flight.

However, it is neither this crate's appearance nor its performance that earns it a place in this article. The real point of interest is the fact that this plane actually used sliding wing panels for increasing or decreasing wing area in flight, with a corresponding increase or decrease of speed. Data on how this arrangement affected its performance is not available, but the fact remains that this was the first instance of the successful application of an idea with which the inventors are still struggling.

They didn't miss much in those days. Records show that, on the 1910 Liore twin-tractor monoplane, the tail-wheel could be turned to steer the plane in running along the ground. The wheel was engaged at will by pulling a hand lever in the plane's cockpit and within easy reach of the pilot.

The "Arup" plane was anticipated back in 1908. As you probably know, this "Arup," invented by "Doc" Snyder, is a monoplane in the true sense of the word, everything being combined into one surface. Some of the credit for this idea should go to an unknown Peruvian who built a plane along these lines in 1908, but whether it was ever completed or flown is a mystery. The only record of it is a picture, taken while it was under construction. I guess this is practically the only airplane designed and built in Peru, whether it flew or not.

Some time ago, an Italian "barrel plane" created quite a sensation in aviation circles. The type now seems to have dropped into oblivion. Well, it is accustomed to oblivion because that's where it has been since 1910, when the "Unic Bertrand Monoplane" appeared. This crate, shown in Fig. 4, had a span of forty-three and three-fourths feet. A thirty-five H.P. "Unic" motor drove one tractor and one pusher propeller.

The weight of the entire machine, including the very brave pilot, was a little over 1,000 pounds. Contemporaneously, the German "Grauvert" monoplane appeared. This was similar in appearance and principle to the plane previously described, except that it had only one propeller. Even these early barrel planes were preceded by the "Beilharz" monoplane of 1909, of which no particulars are available, other than that it was of the barrel type.

Barrel planes may come and barrel planes may go, but helicopters go on forever. And the most discouraging thing is that there has been very little advance in performance or design over the earliest machines. Since all helicopters are practically alike, I will but briefly mention one of the more successful of them.

This was the "Breguet Helicopter," a huge cumbersome affair with vanes rotating in a horizontal plane on either side of a fuselage and between tandem biplane wings. This machine achieved a flight of twenty yards at a height of fourteen feet, which compares favorably with the performance of our most modern helicopters.

A variation of the helicopter principle, which still finds some favor with a certain class of inventors, is the combination airplane and helicopter. This type is merely an ordinary airplane with direct-lift blades attached. Such a plane was the 1910 "Bertin Helicopter," for which no flights are recorded.

Another type, that is related to the helicopter, is the "Paddle Wing" ship. Inventors in Europe (notably Dornier) and the U. S. are attempting to solve the direct lift problem by means of this device. The earliest known application of this idea is the "Irvine Helicopter" shown in Fig. 5. The picture is self-explanatory, the paddles going up sideways and coming down flat. You will agree that the optimism of the inventor was commendable if nothing else was.

Seeing the slow almost negligible development of the Helicopter, makes one wonder if the inventors of such devices are on the right track. There is an old saying, which perhaps you have not heard, "If a thing is right, it looks

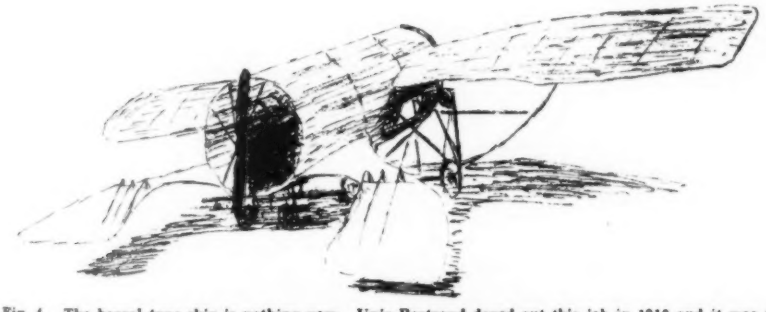


Fig. 4. The barrel type ship is nothing new. Unic Bertrand doped out this job in 1910 and it was a flop then just as the most recent barrel ship has proved a flop. Will history never teach designers anything?

right." Unscientific, but generally true. (Think it over.)

Which reminds me that this is as good a time as any to speak my little piece. It is generally agreed that the airplane, in its present form, has just about reached its highest point of development. But does such a statement mean that the present type of airplane cannot be made safer? Does it mean that the present type cannot be made more foolproof? No, such a statement merely means that a speed of some 700 m.p.h., or so, cannot be attained in the present type. It means that the Atlantic Ocean cannot be crossed in some five or six hours—or less. To which, at the risk of committing a grievous social error, I reply, "And so what?" Are we to grieve that we cannot read London's mail a half day after it was sent? Are we to grieve that we cannot cross the continent in the time between breakfast and luncheon?

I am not one to say, "If the Lord had wanted man to fly, he would have given him wings." But, do not forget the airplane laughs at natural boundaries. *Are we to shed a tear because a European air fleet cannot bomb New York within a few hours of a declaration of war?* Bomb New York, perhaps, before the man in the street knows he is at war or with whom he is fighting?

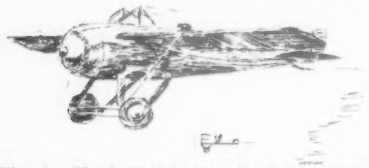


Fig. 6. The beautiful streamlined Deperdussin "Bullet" of 1912, a streamlined marvel that would do well today with more power aboard.

We have seen how the present day airplane contains little or no improvement in essential design over the early pre-war creations. Now we shall see how little the airplane has varied in appearance and performance.

The English are very proud of their lightplanes. We have a couple which we think are pretty good. A lightplane is designed to be economical for the private owner. That, at least, is its chief value. But in the point of economy, the best of them could not hope to compete with the 1909 "Sellers' Quadruplane" designed by Matthew Sellers of Georgia.

This little bus was truly a triumph of early airplane designing. It consisted merely of four heavily staggered wings, of equal span and chord. Powered by a gasoline motor of only five horsepower, it took off and flew at a speed of twenty m.p.h. That this plane was practical was proved by the fact that it flew for over two years without a crackup, which was an exceedingly long life for a plane of the period.

So much for economy of operation. They had some good weight lifting airplanes in those days, too. The "Supermarine" that I described before, could lift a useful load of 950 pounds. But perhaps the best was the 1910 "Breguet." This machine created a record by carrying no less than eight passengers, which is still a good achievement for a single motored ship. The plane was a double-bay biplane with a large gap. The fuselage was set slightly off the lower wing, which was cut away at the fuselage for better vision. The strutting was unusual in that each bay consisted of but a single strut, on the upper end of which there was a good sized fin.

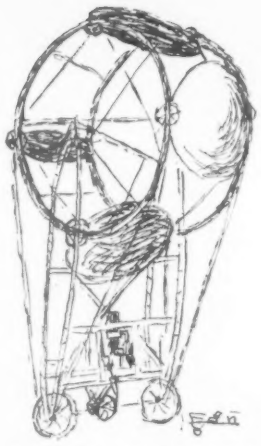


Fig. 5. Paddle-wheel airships are nothing new. This one was devised by Irvine, 'way back when.

One strut was located close to the fuselage on either side and one about two feet from the tip of each lower wing. There were no center-section struts. A large overhang was employed in the wings. The landing gear consisted of five wheels and skids, set well below the fuselage.

Perhaps the most beautiful ship of its day, as well as the fastest, was the 1912 Deperdussin "Bullet." This plane was designed and built for Prevost, a well known early pilot who flew it at the Gordon-Bennett races, where it proved a sensation.

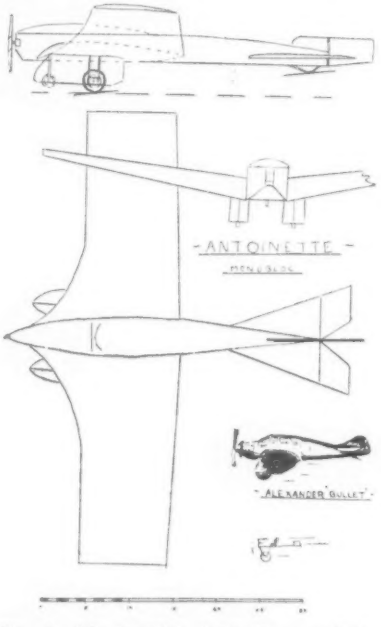


Fig. 8. The beautiful Antoinette monoplane. one of the most graceful flyers of all time.

The plane, shown in Fig. 6, was driven by a Gnome rotary engine which allowed for perfect streamlining of the fuselage. As you know, Deperdussin pioneered the monocoque fuselage which was used on this model. The wings were internally and externally wire-braced. A typical modified shark's fin rudder and a graceful elevator were employed. This sleek and well designed ship clipped off a good 135 m.p.h. on the straightaway.

The plane that started the trimotor idea, from which we are now drawing away, was the 1911 Short "Triple-Tractor." It wasn't a true trimotor for it had only two fifty horsepower Gnome rotary motors, placed in tandem under the same cowling. The center propeller was direct driven by the forward motor. The outboard propellers were driven by chains.

The design of the plane was not very well refined. It was an unstaggered double bay biplane. The upper wing of fifty foot span, had a large overhang, so that the tips had to be braced by long struts, which joined the outer bay of regular struts at the lower ring. This overhang, the square tips and rectangular tail surfaces were characteristic of the Short biplane. The landing gear consisted of two wire wheels and two well braced skids. The entire machine, which was a two seater, weighed 1,700 pounds dead. It boasted a fifty m.p.h. top speed and five hour cruising range.

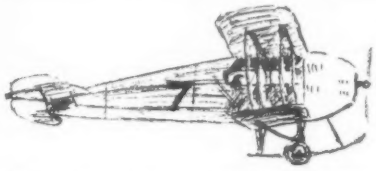


Fig. 7. The first Avro cabin-plane of 1912. Same old stuff that we have today. It was on this ship that Lt. Parks learned all about "tail-spins."

One of the most ambitious projects attempted by an early designer was the "Kimball Biplane." This machine was the first to attempt toward using a large number of propellers. There were no less than four bladed propellers strung out along the tailing edge of the wings. The ambitious part, however, was trying to run all these cumbersome props on one fifty horsepower four-cylinder motor.

The plane was a canard, with a biplane elevator. The landing gear consisted of three wheels and the customary skids. Its big moment was on May 18, 1909. On that day it was christened by Anna Held, the then famous flicker-charmer. (Ask Dad, he knows.) But even such a sendoff couldn't make it fly, because some of the propellers went on a strike for more

(*Concluded on page* 65)

Official N. A. A. Aircraft Records

COMPILED FROM RECORDS OF THE NATIONAL AERONAUTIC ASSOCIATION

In this article will be found world and national records for aircraft as approved by the Federation Aeronautique and the National Aeronautic Association up to and including March 31, 1935. Careful examination will show that the United States holds very few records.

IN PRESENTING this list of official aviation records, we wish to thank the National Aeronautic Association, Washington, D. C., and the Federation Aeronautique Internationale for their kind assistance in providing an up-to-date registry of these outstanding events. Each of the records in the following tabulation was supervised and observed by qualified officials and was conducted in accordance with standard flight procedure.

The necessity for a central authoritative body for establishing accuracy in the certification of records was recognized at an early date. Thus, in 1905, two short years after the Wright Brothers' first flight, the Federation Aeronautique Internationale came into being as the world federation of aeronautic sporting events to which many nations subscribed. This recording tribunal has grown until thirty-four nations of the world are now members of it and the F. A. I. rules governing world record trials and competitions are well known to all men versed in aviation.

For many years, the National Aeronautic Association has been the representative of the F. A. I. in the United States and has supervised all trials for world and international records held in the United States. In addition to the records recognized by the F. A. I., the National Aeronautic Association has supervised the many records of strictly national interest in the United States.

To establish uniformity in the recognition of the many possible aircraft performances, a standard record classification has been adopted by the F. A. I. for world and international records. Records which fall in this classification are referred to as F. A. I. records.

World records are defined as maximum performances regardless of the class or type of aircraft used, according to the following:

CLASSIFICATION FOR WORLD RECORDS

1. MAXIMUM SPEED over a three-kilometer (1.864 mile) course.
2. DISTANCE in a straight line without a stop.
3. ALTITUDE or height.
4. CIRCUIT OF THE WORLD.
5. DISTANCE in a straight line with refueling.

At the last banquet of the National Aeronautic Association, Washington, D. C., many aviation notables were present. At the extreme left is Eddie Rickenbacker. At the extreme right is Jimmie Doolittle.

All other international records and, necessarily the best national performances, are termed INTERNATIONAL RECORDS to distinguish them from the foregoing maximum performances or world's records. International records, therefore, are defined as the best national performances for the classes and categories of aircraft recognized by the F. A. I. The aircraft classes which have been adopted by the F. A. I. for the purpose of providing a standard classification are:

AIRCRAFT CLASSIFICATION CODE

	Class
Free balloons	A
Airships	B
Airplanes	C
Seaplanes	C2
Amphibians	C3
Gliders	D
Autogiros	E
Helicopters	G

But, in case of airplanes, seaplanes and amphibians, there is a further subclassification for Light - Airplanes, Light-Seaplanes and Light-Amphibians in which these craft are classified by empty weight in separate categories. EMPTY WEIGHT is defined as being the total weight of the aircraft in flying order, exclusive of gas, oil, crew, recording instruments, parachutes, oxygen flasks, etc. In water-cooled engines the water in the radiators shall be counted in the empty weight. In the categories for two-seaters (or more), the weight of the crew must be at least 331 pounds or be supplemented to this weight by the use of sealed ballast. The categories are as shown by the table.

CATEGORIES OF AIRCRAFT ACCORDING TO F. A. I.

	Light Airplanes Empty Wt.	Light Seaplanes Empty Wt.	Light Amphibians Empty Wt.
1ST CATEGORY			
2-seaters or more	1,235 lbs.	1,499 lbs.	1,653 lbs.
2ND CATEGORY			
Single-seaters	992 lbs.	1,257 lbs.	None
3RD CATEGORY			
Two-seaters or more	618 lbs.	772 lbs.	None
4TH CATEGORY			
Single-seaters	441 lbs.	552 lbs.	None

For records considered of unusual importance, the F. A. I. awards a special diploma and designates such selected performances, "Records Diplome F. A. I." The records so recognized are: (1) World Records; (2) International Records for Airplanes, Seaplanes, Amphibians and Autogiros without load (with the exception of speed for 100 kilometers); (3) International Records for the greatest payload transported to a height of 2,000 meters (6,561 feet); and (4) International records for Light-Airplanes, Light Seaplanes and Light Amphibians with the exception of performance for altitude and speed for 100 kilometers. We can now pass on to the actual records established up to the time that this issue of POPULAR AVIATION is going to press.

PRESENT OFFICIAL WORLD AIR RECORDS

(Established by the Federation Aeronautique Internationale.)

PRESENT OFFICIAL WORLD AIR RECORDS
(Established by the Federation Aeronautique Internationale)

Maximum Speed over a 3-kilometer course ..... 440.681 m.p.h.
By Francesco Agello, Italy, Oct. 23, 1934.
Airline Distance ..... 5,657.387 miles

(Continued on next page)

By M. Rossi and P. Codos, France, Aug. 5, 6, 7, 1933.

Altitude .....61,236.691 feet
Lt. Comdr. T. G. W. Settle and Major Chester L. Fordney, U.S.M.C., United States, Nov. 20, 1933.

Circuit of World.....No Record

Airline Distance with Refueling.....No Record

* * *

NATIONAL AND INTERNATIONAL CLASS RECORDS
Airplanes (Class C)

Airline Distance (International)....5,657.387 miles
M. Rossi and P. Codos, France, Brooklyn, N. Y., to Rayack, Syria, Aug. 5, 6, 7, 1933.
National (U. S.) Record.....5,011.800 miles
Russell N. Boardman and John Polando, Brooklyn, N. Y. to Istanbul, Turkey, July 28, 29, 30, 1931.

* * *

Altitude (International) .....47,352.219 feet
Comdr. Reynato Donati, Italy, April 11, 1934.
National (U. S.) Record.....43,165.880 feet
Lt. Apollo Soucek, United States, June 4, 1930.

* * *

Maximum Speed (International record) .....314.319 m.p.h.
Raymond Delmotte, Istres, France, Dec. 25, 1934.
National (U. S.) Record.....304.98 m.p.h.
James R. Wedell, Glenview, Ill., U.S.A., Sept. 4, 1933.

* * *

Speed for 100 KM. (International) without payload .....268.217 m.p.h.
R. Delmotte, France, May 24, 1934.
National (U. S.) Record.....266.032 m.p.h.
J. R. Wedell, New Orleans, La., U.S.A., Feb. 17, 1934.

* * *

Speed for 1,000 KM. (International) without payload .....254.255 m.p.h.
Miss Helene Boucher, Istres, France, Aug. 8, 1934.
National (U.S.) Record.....127.418 m.p.h.
Lt. H. R. Harris and Ralph Lockwood, Dayton, O., March 29, 1923.

* * *

Speed for 10,000 KM. (International) without payload .....93.114 m.p.h.
J. LeBrix and M. Doret, France, June 7, 8, 9, 10, 1931.
National (U.S.) Record.....None

* * *

RECORDS WITH PAYLOAD OF 500 KILOS. (1,102.311 lbs.)

Altitude (International) with payload above .....33,743.334 feet
M. Signerin, France, Sept. 21, 1932.
National (U.S.) Record.....28,143.00 feet
Lt. H. R. Harris, Dayton, O., May 21, 1924.

* * *

Speed for 10,000 KM. (International) with payload .....215.912 m.p.h.
R. Untucht, Germany, March 22, 1933.
National (U.S.) Record.....None

* * *

RECORDS WITH PAYLOAD OF 1,000 KILOS (2,204.622 lbs.)

Altitude (International) with payload above .....29,461.853 feet
M. Signerin, France, Sept. 23, 1932.
National (U.S.) Record.....20,820.000 feet

* * *

Speed for 1,000 KM. (International) with payload above .....174.760 m.p.h.
M. Lemoine, France, March 8, 1933.
National (U.S.) Record.....152.700 m.p.h.
Leland F. Schoenhair Jacksonville, Fla., Feb. 20, 1930.

* * *

Speed for 2,000 KM. (International) with payload above .....158.606 m.p.h.
M. Doret, Capt. Terrasson, Lt. Lecarme, France, Sept. 7, 1933.
National (U. S.) Record.....None

* * *

RECORDS WITH PAYLOADS OF 5,000 KILOS (11,023 lbs.)

Altitude (International) with payload above .....21,814.239 feet
Lucien Coupet, France, June 16, 1934.
National (U.S.) Record.....None

* * *

Speed for 1,000 KM. (International) with payload above .....None

* * *

RECORDS WITH PAYLOADS OF 10,000 KILOS (22,046 lbs.)

Altitude (International) with above payload .....10,597 feet
Cav. Domenico Antonini, Italy, Feb. 22, 1930.
National (U.S.) Record.....None

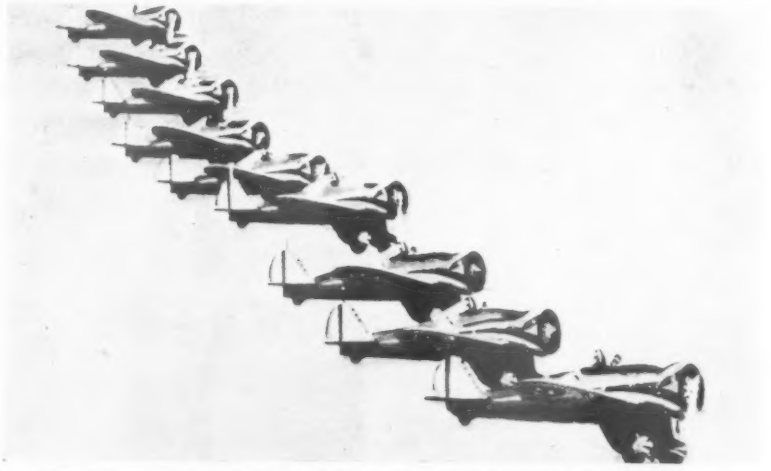
* * *

GREATEST PAYLOAD CARRIED TO AN ALTITUDE OF 2,000 M. (6,671.7 ft.)

PAYLOAD (International to above altitude .....22,0.46.222 lbs.
Cav. Domenico Antonini, Italy, Feb. 22, 1930.
National (U.S.) Record.....4,409.244 lbs.
Lt. H. R. Harris, Dayton, O., Oct. 25, 1923.

(*Concluded on page* 56)

Practice Formation Flight at March Field



Regularity and poise in formation flight is well illustrated by this squadron of planes.

A SQUADRON of U. S. Army pursuit planes is shown engaged in a nice tight little formation, practicing for the Army Day show at Glendale, Calif. These ships were caught by the camera at March Field while they were practicing the "Golden Stairs," or whatever the Air Corps equivalent may be.

It seems almost possible that plane roaring over the terrain at speeds approximating 200 miles per hour could be kept in such perfect alignment and spacing. It is just as if the ships in this picture had been spaced off with an architect's rule and dividers.

Air-Minded Switzerland

by JOHN C. A. WATKINS

SWITZERLAND, the land of electrified railways and spectacular automobile roads, is keeping pace with the trend of times by also promoting aviation.

True enough, the land of the Alps covers an area of only 15,737 square miles, but this seemingly limited flying territory offers a variety of scenery which cannot be duplicated anywhere. Seasoned pilots, who have for years soared above this Garden of Eden, which Providence so generously established for the enjoyment and rejuvenation of mankind, are still discovering new charms in the landscape revealing itself below them.

Climbing smoothly, the airplane passes over blue-eyed lakes and sparkling rivers, over villages and towns, which have jealously preserved ancient styles of architecture and time-honored customs and traditions. Upward it climbs, over blossom-strewn pastures, where alp-horn and yodel have their home, up to the sphere of mighty glaciers and snow-capped peaks, and—higher still. Valley succeeds valley, some with familiar landmarks, others even unknown to native passengers. A new Switzerland unfolds itself from the air.

"No more geography for me!" declared a much-read writer after his first Swiss aerial excursion, "for the eager eye sees so much more than can ever be expressed on paper. To think that I have been to Switzerland all these years and that only now I have realized I have been there!"

The popularity of air-travel in Switzerland has increased, after the numerous international airlines, with which the country is linked up, became a well-established fact.

Circular trips and excursions over the Alps are flown from the aerodromes at Basle, Berne, Geneva, Lausanne, St. Gall and Zurich. A hydroplane service is, in addition, available during their respective seasons in tourist centers, such as Interlaken, Lucerne, Lugano and Locarno, where hydroplanes can be hired for short or long distance trips and Alpine flights.

Circular flights in cabin planes may be enjoyed over the cities of Geneva and Zurich at 10 Swiss Francs per person; over Berne and environs at 12 Swiss Francs; over Lausanne and environs at 10, 12 or 15 Swiss Francs, and over Basle or St. Gall and environs at 12 or 15 Swiss Francs.

Alpine flights lasting from approximately one hour to three hours are available from any of the before-mentioned aerodromes, the rate of these sightseeing flights ranging from 30-200 Swiss Francs. These latter aerial excursions include mountains such as the Santis, Glarnisch, Todi, Rigi, Titlis, Jungfrau, Finsteraarhorn, Blumlisalp, Matterhorn, Mont Blanc, also the Bernina range and other peaks in the Grisons.

From the aerodromes in Basle,

(*Concluded on page* 56)

Souvenir Hunters Dismantle Plane

CADET JOHN S. GILMARTIN, newest candidate for the "Caterpillar Club," bailed out over Colton, California, while on a return trip to March Field from gunnery practice.

Before officials could get to the scene, souvenir hunters had almost dismantled the plane, even the engine being removed. So wroth were the officers that a campaign was started, via the newspapers, to apprehend the vandals.

It was important that they secure the return of the engine in order to learn the cause of it ceasing to function. Army rules may require a pilot to pay for some of the material if it is not recovered. Again, it is a felony for any person to so ruthlessly destroy property belonging to the government—or for that matter, to any person.

It is hoped that, through the pages of POPULAR AVIATION, this fact may become known to a number of persons vitally interested in aviation who will take steps, in case of accident to some unknown flyer, to post a guard about the scene, thus preventing destruction of valuable property. Aviation, we feel is still in its infancy, and from things learned at scenes of accidents, officials may garner vital statistics that will prove of great benefit to those that come after.

After making several vain attempts to get the motor started, Cadet Gilmartin stayed with the ship until it reached a sparsely settled portion of the town, then took to his 'chute at 1500 feet, which, when you come to see it from above, seems altogether too small a space. The flyer landed near an orange packing house, without damage to himself, while the plane struck an open field near the bed of the Santa Ana river.

So effective was the warning in the papers that, the next day, people began drifting into the Colton Police station bearing their portion of the dismantled plane, which they handed over with the excuse, "we only wanted a souvenir."

Much valuable property was included in the thefts.

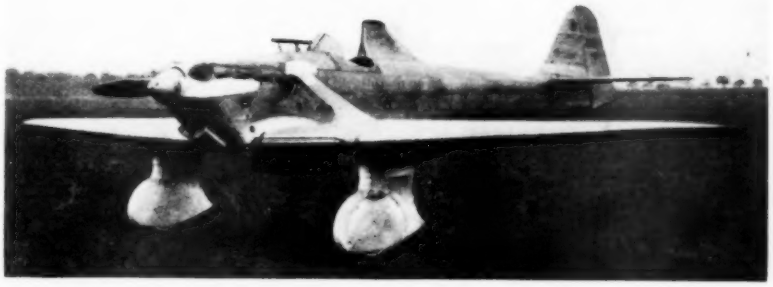
Karl Ort's New Catalogue

IT IS always a pleasure to announce one of Karl Ort's new catalogues because we enjoy thumbing through the pages and looking over the really remarkable display of aeronautical goods. There is everything from tacks to Hispano-Suiza engines, all of which are described in the most entertaining and instructive manner.

The 1935 edition of the Ort catalogue lists a great variety of standard merchandise needed by pilots, aero-mechanics and homebuilders, such as flying togs, instruments, engines, propellers, accessories of all sorts, tubing, dope, etc., etc. This well illustrated book can be had by sending a dime to Karl Ort, 608-40 West Poplar, York, Penn.

Details of the Morane-Saulnier 325

(See front cover)



Three-quarters front view of the Morane-Saulnier Type 325 monoplane pursuit production. This will be found reproduced on the front cover in full colors.

THE M. S. 325 pursuit Monoplane is constructed entirely of metal with the exception of the lining of the tail-planes and comprises, besides its equipment, two machine guns, a wireless telegraph set and an oxygen apparatus for flights at great altitudes.

The location for the pilot has been carefully studied, so as to give the latter the best visibility possible—visibility not only as to firing, but also as to observation. This visibility is improved by the possibility of regulating the height of the seat while flying and by the cut-out section of the rear of the wing near the hull.

The landing gear is of the wide-wheelbase type; each half of the landing gear consisting only of a bracket formed of an oleo-pneumatic shock absorber and a fork for the support of the wheel bearing. The machine-guns are on the wings, near the landing-gear. The fuel tanks are located in the central part of the wing, on each side of the fuselage. These tanks may be cast off separately and, when one of them is cast off, the motor can continue to operate perfectly well, without there being any stopping in the circulation of the fuel.

SPECIFICATIONS

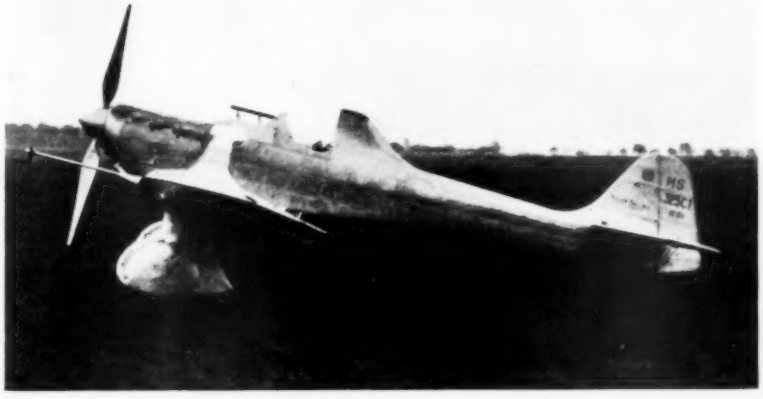
Span	11 m	80	38'7½"
Length	8 m	254	27'0½"
Height	3 m	423	11'2½"
Wing surface	19 m²	73	209 sq. ft.

The fuselage consists of a metallic hull, ovoid in shape, composed of braces fastened by three longerons and rib-bands, the whole being lined with a riveted duralumin sheet.

The wing, which is low and of the semi-cantilever type, rests on a single strut which is fastened to the upper part of the hull. It consists of two spars which are parallel to the wing span and of caissons and strips parallel and perpendicular respectively to the span, the whole forming a lattice-work on which the sheet-metal is riveted.

The leading edge of the wing, made of a single piece and detachable, is fastened to the spar AV by means of two hinges. The cross-piece, located to the right of the strut fastening, is replaced by a strong caisson formed by two cheeks which are braced by means of a buckle, this constituting the fixation of the landing-gear on the wing and holding the gap of the spars to the right of the single strut fastening.

(*Concluded on page* 48)



Side elevation of the Morane-Saulnier Type 325 pursuit plane showing the peculiar "hump" just aft of the cockpit.

Some Pertinent Dope on

WHILE the red-nosed Fokker is the favorite air-chariot of the war-fiction writers, yet there were many other planes employed by the Central Powers that saw service on the various fronts and at different periods during the war that deserve notice.

Prominent examples of the little discussed planes are the Rumpler, Ago and Euler, shown here, and then the others such as the Aviatik, A. E. G., B. W. F., Brandenburgische, Halberstadt, D. F. W., Friedrichshafen, Goedecker, Grade, Hannoverische, Hansa, Hansa-Brandenburgh, Hanuschke, Jatho, Jeanin, Roland, Otto, Mercur, N. F. W., Pippart-Noll, Pfalz, Rex, etc.

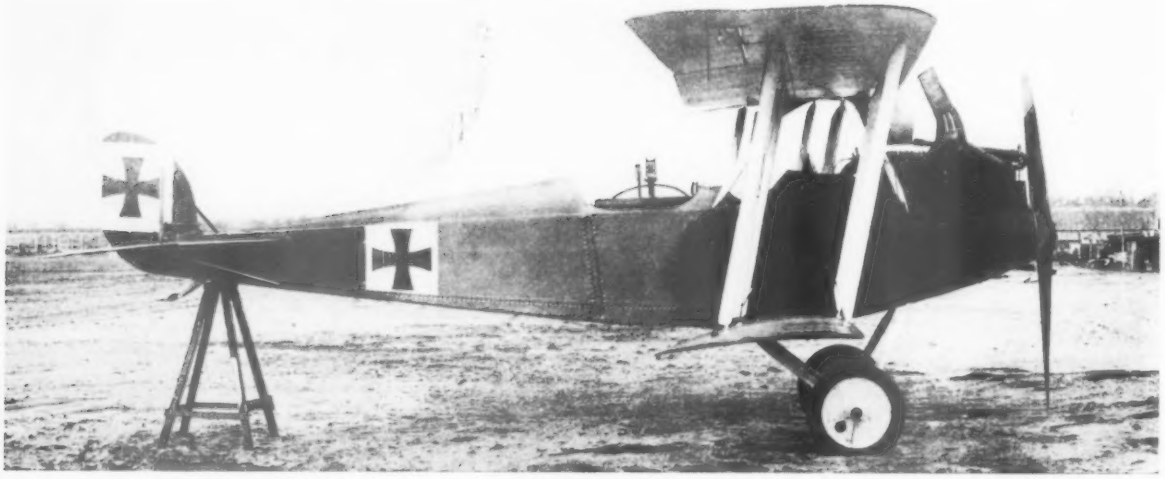
The Rumpler warplanes, of which two examples are shown here, were built by the Rumpler Werke, G. m. b. H., located at the Johannisthal airdrome near Berlin. Prior to the war, this firm was known as E. Rumpler, Luftfahrzeugbau. The Rumpler planes were used extensively throughout the war.

E. Rumpler was the former chief engineer of the Daimler Motoren Gesellschaft, one of the earliest automobile companies in the world, and upon the advent of aviation, turned his mind to the newer vehicle—the airplane. He then acquired the license for building the Etrich Taube, the product of an Austrian engineer. It was on these machines that Hirth attained his early successes in European competitions. Strange enough, the "Taube" means "dove" and it was a tough enough dove during the war.

Finally, due to controversies between Rumpler and Etrich, the latter dropped his patent rights and Taubes were then built by practically all of the Central Powers during the beginning of the war. Hirth then quit the Rumpler works and this led to a great loss of prestige by Rumpler who depended for publicity upon the frequent winnings of Hirth. Finally, the Taube idea with the back-swept elastic wing-tips was dropped and were replaced by the more conventional ailerons.

After this change, Rumpler started building biplanes with steel tube fuselage—canvas covered—on which Rasser made many records. It was one of the first planes to standardize upon this class of construction, and the construction was more or less continued throughout the duration of the war.

The Rumpler Type Ru-C1, powered with 150-160 Mercedes.



The Rumpler Type Ru-C7, 1918, powered with a 260 h.p. Mayback.

Prominent Enemy Aircraft

While the upturned wing tips and backsweep was discontinued, yet there is always evidence in all of Rumpler's designs that he favored the flexible trailing edge idea.

During the period of the war, the Rumpler biplane was employed both as a landplane and seaplane. The biplane was a tractor type, and had a characteristic type of nose and engine mounting by which it could be easily distinguished from other planes. Another stock feature in the design of the Rumpler planes was the spacing of the interplane struts, the outer two being farther apart than between the center strut and the center-section strut. This was a distinct structural advantage, reducing the stress on the wing-spars and flying wires.

The Rumpler two-seater was the most commonly used of the Rumpler planes and, in the great majority of cases, was provided with a water-cooled engine. The addition of an exhaust stack to the exhaust manifold for carrying the gases over the top plane was also a very common feature, although not exclusive, of the Rumpler planes.

The two Rumpler planes shown here are representative types. The first, the Ru-C1, produced in 1916-1917, was powered with a 150-160 h.p. Mercedes water-cooled engine. The Ru-C7, a much more advanced and faster type, was produced during 1918 and was powered with a 260 h.p. Mayback engine. The design charactertics are very similar in both cases and easily identified by their external appearance.

Next in line we have the Ago which introduced many novelties in constructional details. It was produced by the Flugzeugwerke G. m. b. H., Johannisthal, Berlin, just outside the entrance to the Johannisthal flying grounds. This company was originally a branch of the Otto Company in Munich, taking its name "Ago" from the firm's initials —Aerowerke Gustav Otto. The wing and fuselage structures abounded in original constructional details which we hope to illustrate at some future time.

At the outbreak of the war, the Ago Company was mostly engaged in experimental and development work with both land and seaplanes and in addition to being a manufacturing plant, really was an engineering institution of no

(*Concluded on page 54*)

The Euler Type B-1, 1914, Reconnaisance plane, 100-120 h.p. Mercedes.

The Ago Type C-1, 1915, Twin Fuselage plane, 150 h.p. Benz.

The Aero-Sportswoman

by JOAN THOMAS

SETTING new speed records, hopping oceans and making stratospheric flights may be good fun for the pilot, as well as excellent publicity for aviation, but this month we want to pay tribute to the "forgotten men" of aviation, the *flying instructors.*

As a member of the 99s, we have been proud to record the achievements of such flyers as Amelia Earhart, Ruth Nichols, Phoebe Omlie and Helen Richey, but is flying an ocean or holding a transport job any more important than the record of having soloed forty students in the last eighteen months? All of which, is by the way of introducing Janet Knight, owner and chief instructor of the Summit Flying School on the San Francisco Municipal Airport!

Anyone, who has been able to run a successful flying school during the last few years, must be a pretty good business person as well as a flyer. And we feel that they should be given high honors for carrying on against terrific odds. Therefore, the *Aero-Sportswoman* is happy to pay tribute to "the girl of the golden west," who is one of the few women flying-school owners in the country.

Miss Knight began flying in 1930 and was the first woman to receive a transport license at Mills Field, San Francisco. In 1932 she was made assistant-instructor of the Summit Flying School and put in charge of the Mills Field Branch, while the other instructor carried on at Sacramento. After the death of the owner of the school, she bought it and has conducted the school for the past year and a half.

She does all her own instructing, including night flying and ground-school courses. She has a system whereby her students must pass a test in the ground-school work before they can advance with their flying. A plan that has been very effective in helping her develop her school, and a reputation for giving a thorough training.

She owns and operates a Fleet and a Monoprep. She does a great deal of her own mechanical work, and has had over a 1,000 hours in the air, of which, more than 100 hours has been night flying. She has soloed some forty students—and *only two of those have been women!*

Such a record speaks for itself, so it is perhaps unnecessary to add, that Janet is not only well liked but holds the respect of everyone around the field. She is in the game purely from the business standpoint and is on job seven days of the week from day-break until long after sundown. She says she regrets that flying for business has taken some of the fun out of it for her, as she never has time to fly for pleasure or to take part in any aerial tours such as the Bay Cities chapter of the 99 club, there in San Francisco, sponsored every month. We are sure that the club is proud of her achievements—even though she is too busy to take an active part in their work, or to share their fun.

Miss Janet Knight, holder of a transport license, who conducts the Summit Flying School. She has soloed 40 students.

* * *

A "new deal" for the private flyer, is the avowed purpose of the Chicago Suburban Aviation Corporation. This is *not* just another club, nor is it a scatter-brain theory for reducing the cost of flying, willy-nilly. They have a very carefully worked-out plan of operation, which is based on a study of the under-lying factors and fundamental needs of the industry.

The idea and ideals, of the Corporation's new plan, were the work of the late William F. Strine, then manager of the Stinson Airport at LaGrange, Illinois. Mr. Strine, whose untimely death due to an accident on the highway (he was struck by a car while changing a tire) was formerly President of the Illinois Air Pilot's Association. He was also, Illinois director for the Independent Aviation Operators of the United States, and a member of the Joint Aviation Coordinating Committee for Illinois.

Mr. Strine was sincere in his work, and indefatigable in his efforts to secure favorable legislation and Government-aid for aviation—particularly in connection with private flying! He held

(*Concluded on page* 64)

The Ballad of a Bristol

(*Kindly Submitted by William Krames*)

There's a good half dozen buses
On which I've done a whack,
From the R.E. 8 to the three-ton weight
Of the lumbering old big Ack;
On a rotary engined Avro
I've attempted several tricks,
And I'm quite a dab at steering a crab
(Better known as a D.H. 6).

And many a first rate joy ride
Have I had on 'em last and first.
And many a strut
Have I had go phut,
And many a wheel tire burst;
But none of 'em knows the secret
Of making my heart rejoice
Like a well-rigged Bristol Fighter
With a two-six-four Rolls-Royce.

She leans at her place on the tarmac
Like a tiger crouched for a spring,
From the arching spine of her fuselage line
To the ample spread of her wing.
With her wires like sinews tautened
And her tail-skids jaunty twist,
Her gray cowled snout juts grimly out
Like a tight clenched boxer's fist.
Is there a sweeter music,
A more contenting sound,
Than the purring clop
Of her broad curved prop
As it gently ticks around?

Open her out crescendo
To a deep toned swelling roar
Till she quivers and rocks
As she strains at the chocks
And clamors amain to soar.

Whisk 'em away, my hearties,
Taxi her into the wind,
Then away we skim on a spinning rim
With the tail well up behind;
Hold her down to a hundred,
Then up in a climbing turn
And off we sweep in a speckless sky
Till we catch our breath in the air, Alp high;
I wouldn't exchange my seat, not I,
For a thousand pounds to burn.

100 Octane Gasoline Now Possible

THE Army Air Corps has just made a report to the Institute of the Aeronautical Sciences of sensational speeds attained by the use of a new gasoline that has recently been developed—100 Octane gasoline. It has been found that it adds 35 miles per hour to an airplane's speed without any other changes whatever.

Octane means anti-knock. Heretofore, the highest obtainable by the Army has been 92 and the highest commercially available is 70 or 80.

Two thousand gallons of the experimental gasoline has been prepared by the Army and is undergoing exhaustive tests. Experts believe that the new fuel brings the five-hundred-miles-an-hour mark within the realm of possibility.

P. A.'s Aviation Trade Directory

A compilation of manufacturers in the aircraft industry, their names and, where possible, the trade-names and code designations of their products. We have been assisted in this listing by the Bureau of Air Commerce.

OUR readers will find this directory to be a most useful feature that has been requested by hundreds of our correspondents. It is a carefully compiled list of airplane manufacturers, their addresses and the trade names of their products. The listing is unusually complete for, in its compilation, we were kindly assisted by the U. S. Bureau of Air Commerce and similar authoritative sources of information.

So far as possible, all manufacturers have been included who have been or are in active production for the past three years. This will make it possible for you to trace old concerns for various purposes of your own as well as the firms who are now in production and who have produced airplanes during the year 1934. To distinguish present going concerns from those who either are not producing or are in the doubtful category, the names of 1934 and 1935 producers are printed in heavy bold-faced type. All doubtful concerns are listed in light-faced type.

Some of the concerns listed have produced only a few planes during 1934 while others have had a considerable amount of business. There is no means known by which exact data can be obtained upon the size of these plants nor their financial responsibility, hence it must not be assumed that we make any guarantee as to the stability, character or financial resources of the firms listed. We only know that they exist or have existed at the given address.

In our next issue we will print the names and addresses of aeronautical engine and aviation accessory manufacturers as well as the addresses of the builders of lighter-than-air craft. The complete series, so far as possible, will cover the entire field of aviation and aviation products.

Several of the larger concerns produce aircraft in such variety and under so many different code names that it is not advisable to attempt mention of all of their models. This would only result in confusion. However, in the cases of firms producing up to six different models, the names of the models produced during this year have been included. This will prove useful in locating the manufacturer of a given plane when only the code names are known. If the airplane manufacturer also makes engines, the fact is noted.

It will also be noted, that when one concern has been absorbed by another and no longer operates under its original name, that the reader is referred to the present owner or operator of the plant. A number of such consolidations have taken place recently and many old established products are now being built by other manufacturers.

List of Airplane Manufacturers

Aeromarine Plane and Motor Company (Inc.), Keyport, N. J.

Aeronautical Corporation of America, Lunken Airport, Cincinnati, Ohio. Producers of **Aeronca** lightplanes, and engines.

Aero Sport Aviation Co., 521 N. Pomona St., Fullerton, Calif.

Aeronautical Industries of Louisiana, P. O. Box 489, Monroe, La.

Aircraft Mechanics (Inc.), 3200 N. Nevada Ave., Colorado Springs, Colo.

Aircraft Research and Development Co., c/o Hugh Thompson, 1732 Grand Ave., Kansas City, Mo.

Airplane Development Corporation, 1044 Airway Drive, Grand Central Air Terminal, Glendale, Calif. Builders of **Vultee** transports.

Alhambra Airport and Air Transport Co., Alhambra, Calif. Builders of the **Alcor-Duo-6,** twin motored transport.

American Eagle-Lincoln Aircraft Corporation, Fairfax Airport, Kansas City, Kans. Builders of **American Eaglet.**

American Gyro Company, Denver, Colo. Builders of the American **Gyro Crusader.**

Amphibions (Inc.), Roosevelt Field, Garden City, L. I., New York.

Anson Aero Manufacturing Company, 5115 Market St., Youngstown, Ohio.

Argonaut Aircraft (Inc.), Tonawanda, N. Y. Builders **Argonaut Pirate.**

Arrow Aircraft and Motors Corp., 4133 N. 56th St., Lincoln, Nebr.

Arup Manufacturing Corp., 434 N. Cushing St., South Bend, Ind. Builders of the **Arup Flying Wing.**

Bach Aircraft Co., L. A. Metropolitan Airport, Van Nuys, Calif.

Barling Aircraft (Inc.), 526 N. Second St., St. Joseph, Mo.

Beech Aircraft Company, P. O. Box 7, Wichita, Kans. Builders of the **Beechcraft** planes.

Bellanca Aircraft Corporation, New Castle, Dela. Builders of **Bellanca** planes.

B/J Aircraft Corporation, Dundalk, Baltimore, Md. Builders of Military planes. (Formerly, Berliner-Joyce Corp.)

Boeing Airplane Company, Georgetown Station, Seattle, Wash. Builders of all types, military planes, the **Boeing 247** transport planes, trainers, etc.

NOTE! In the following list of aviation concerns, all companies indicated by heavy bold-faced type have produced aircraft during 1934 and many of them, in 1935. The others, in light-faced type either have not produced during this time or their status is unknown.

Bowlus, Wm. Hawley, San Fernando, Calif.

Brown (Lawrence W.) Aircraft Co., Los Angeles, Calif. Builders of special racing planes.

Brown Metalplane Co., E. 404 Sprague Ave., Spokane, Wash.

Byrd-Wendt Aircraft Corp., 2107 Fulton St., Chicago, Ill.

Cairns Aircraft Corp., Naugatuck, Conn. Builders of **Cairns** planes.

Cessna Aircraft Co. (Inc.), 5800 Franklin Rd., Wichita, Kans. Builders of **Cessna** planes, for private use and light military types.

Champion Aircraft Corp., Downey, Calif.

Command-Aire (Inc.), Little Rock, Ark.

Consolidated Aircraft Corp., 2050 Elmwood Ave., Buffalo, N. Y. Builders of **Consolidated** military planes, **Fleet** sportplanes, etc.

Corben Sport Plane Co., 2022 E. Johnson St. (or Madison Airport), Madison, Wis. Builders of planes and kits for **Junior-Ace, Baby-Ace** and **Super-Ace** sportplanes.

Crawford Power Glider Manufactory, Seal Beach, Calif.

Crown Body Corp. (Ltd.), Aircraft Division, 2500 McPherson St., Los Angeles, Calif.

Cunningham-Hall Aircraft Corp., 13 Canal St., Rochester, N. Y.

Curtiss Aeroplane & Motor Co. (Inc.), Kenmore and Vulcan Sts., Buffalo, N. Y. All types of planes, military and civilian.

Curtiss-Wright Airplane Co., Lambert Field, Robertson, Mo. All types of planes. Builders of **Curtiss Condor** transport plane.

Cycoplane Company (Ltd.), Los Angeles, Calif.

Davis Aircraft Corp., 1100 N. East St., Richmond, Ind. Builders of **Davis Model D1-W.**

Detroit Aircraft Corp., 607 Shelby St., Detroit, Mich.

Douglas Company (The), 3000 Ocean Park Blvd., Santa Monica, Calif. Builders of military planes and the **Douglas** transport planes.

Edo Aircraft Corp., Avenue "A" and Second St., College Point, L. I., N. Y.

Eyerly Aircraft Corp., Salem Airport, Salem, Ore.

Fairchild Aircraft Corp., Hagerstown,

Md. Builders of all types of commercial and sportplanes.

Fleet Aircraft (Inc.). See Consolidated Aircraft Corp.

Fleetwings (Inc.), Bldg. 61, Roosevelt Field, Garden City, L. I., N. Y.

Ford Motor Company, Airplane Division, Dearborn, Mich. (Discontinued.)

Franklin Glider Corporation, Ypsilanti, Mich.

General Aviation Manufacturing Corporation, Dundalk, Md. Builders of all types of planes.

General Western Aero Corp. (Ltd.), General Western Airport, Santa Barbara, Goleta, Calif.

Granville Brothers Aircraft (Inc.), Springfield, Mass. Dissolved, see Granville, Miller and deLackner. Formerly builders of the Gee-Bee racer.

Granville, Miller and deLackner, Springfield, Mass. Builders of the racing plane and sportplane R6H.

Great Lakes Aircraft Corp., 16800 St. Clair Ave., Cleveland, Ohio. Builders of the trainer 2T-1A.

Gross Sailcraft Company, Akron, Ohio.

Grumman Aircraft Engineering Corp., Farmingdale, L. I., New York. Builders of the **Grumman** military and naval planes.

Hall-Aluminum Aircraft Corp. See **Consolidated Aircraft Corp.**

Hammond Aircraft Corp., N. Huron St., Ypsilanti, Mich. Builders of sportplanes and the special planes for the Bureau of Air Commerce.

Harper Aircraft Co. (Inc.), Berbard Airport, Youngstown, Ohio.

Hawke Crop Dusting Co., 919½ Tenth St., Modesto, Calif.

International Aircraft Corporation, Niles, Mich. Builders of the **Heath Parasol** and kits.

Kellett Autogiro Corp., 721 Atlantic Building, 260 Broad St., Philadelphia, Pa. Builders of the **Kellett Autogiro.**

Kinner Airplane and Motor Corp. (Ltd.), 635 W. Colorado Blvd., Glendale, Calif. Builders of **Kinner Sportplanes** and engines.

Kreider-Reisner Aircraft Co. (Inc.), 1 Park Lane, Hagerstown, Md.

Laird (E. M.) Airplane Co., 5301 W. 65th St., Chicago, Ill. Builder of all planes, transports, racers, sportplanes.

Lambert Aircraft Corp., St. Louis, Mo. Builders of the **Monocoupe** sportplane, 90-A.

Lockheed Aircraft Corp., Empire Ave. and San Fernando Rd., P. O. 1117, Burbank, Calif. Builders of all types of planes among which are the **Electra, Orion, Vega** and **Altair 8E.**

Loening (Grover) Aircraft Co. (Inc.), Hangar 17, Roosevelt Field, Garden City, L. I., N. Y. Builders of the Loening Flying boats and amphibians.

Luscombe Airplane Corp., West Trenton, N. J. Builders of the **Luscombe Phantom.**

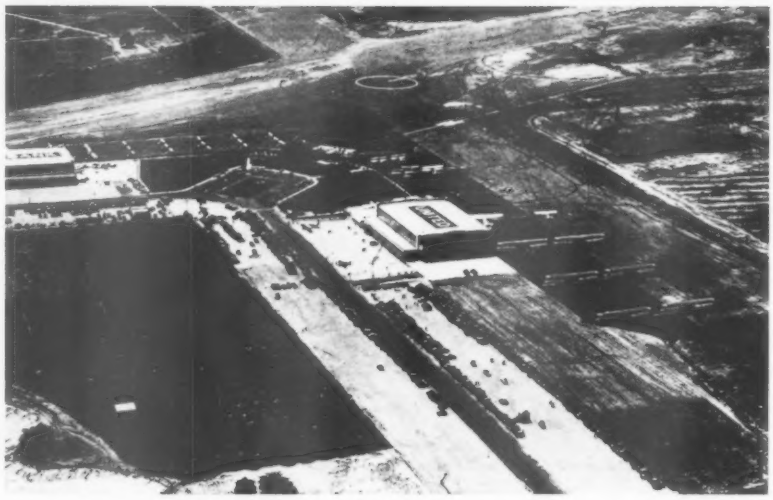
Maliszewski Brothers Aircraft, 1606 E. Belleview Pl., Milwaukee, Wis.

Martin (The Glenn L.) Company, Baltimore, Md. Builders of all types of military planes. The **Martin Bomber.**

Mercury Aircraft (Inc.), Hammondsport, N. Y. Builders of the **Mercury Chic T-2.**

Merrill Aircraft Co., Rawson St. and Nelson Ave., Long Island City, L. I.

Metropolitan Aircraft Corporation, Hasbrouck Heights, N. J.



The aviation industry embraces a large variety of equipment and investments. Not only the airplanes themselves but everything that is connected with their operation is commercially important, hangars, accessories, airports, airport equipment, airport and building construction, etc. Additional lists will appear in later issues of P. A.

Michigan Aircraft Co., 13210 French Rd., Detroit, Mich.

Monocoupe Corporation, Lambert Field, Robertson, Mo. Dissolved. See Lambert Aircraft Corp.

National Aeroplane and Motor Company (Inc.), Muskogee, Okla.

National Airplane and Motor Co., Billings, Mont. Builders of the **National Bluebird** lightplane.

Northrop (The) Corporation, Los Angeles Municipal Airport, Imperial Highway, Inglewood, Calif. Builders of military and commercial planes such as the **Gamma 2D, Delta 1-D.**

Peerless Aircraft Corp., 3407 W. 66th Pl., Chicago, Ill.

Pennsylvania Aircraft Syndicate (Ltd.), Wilford Bldg., Philadelphia, Pa. Builders of the **Gyroplane XOZ-1.**

Pietenpol (B. H.), Spring Valley, Minn. Builder of the **Pietenpol Air-Camper** lightplane and kits.

Pitcairn Autogyro Co., Pitcairn Field, Willow Grove, Pa. Builders of Autogiros and military planes.

Porterfield Aircraft Corp., Kansas City, Mo. Builders of the **Porterfield Flyabout** lightplane.

Rearwin Airplanes (Inc.), Fairfax Airport, Kansas City, Kans. Builders of sportplanes, **Rearwin Sportster, Rearwin Speedster,** etc.

Rose Aeroplane & Motor Company, 4439 N. Clark St., Chicago, Ill. Builders of the **Parrakeet A-1** lightplane.

Ryan Aeronautical Corp., Lindbergh Field, San Diego, Calif. Builders of the **Ryan** sportplanes, the **Ryan ST,** etc.

Security National Aircraft Corporation, Downey, Calif. Builders of the **Airster S-1A.**

Seversky Aircraft Corp., 570 Lexington Ave., New York, N. Y. Builders of the **Seversky** monoplanes.

Sikorsky Aviation Corporation, Bridgeport, Conn. Builders of the **Sikorsky** flying-boats and the **Amphibions.**

Spartan Aircraft Co., Sheridan Rd., Tulsa, Okla. Builders of the **Spartan** sportplanes.

Speed-Bird Corporation, Keyport, N. J.

Sportsman Airplane & Supply Co., 319 W. Boundary, Hobart, Okla.

Star Aircraft Company, Bartlesville, Okla. Builders of the Model **E Star.**

States Aircraft, 1632 Wentworth Ave., Chicago Heights, Ill. Builders of the **States** sportplane.

Stearman Aircraft Co., Box 1960, Wichita, Kans. Builders of **Stearman** sportplanes and military planes.

Stinson Aircraft Corporation, Wayne, Mich. Builders of commercial and sportplanes, the **Airliner, Reliant,** etc.

Straughan Aircraft Company, Wichita, Kans. Builders of the **Straughan** Ford powered lightplane.

Swallow Airplane Company, 24th St. and Hillside Ave., Wichita, Kans.

Taylor Aircraft Company, Emery Airport, Bradford, Pa. Builders of lightplanes, the **Taylor Cub E-2, F-2,** etc.

Timm Aircraft Corp., 1032 Newby St., Glendale, Calif.

Towle Aircraft Co., 261 St. Aubin St., Detroit, Mich.

Trella Aircraft, 125 W. Lafayette Blvd., Detroit, Mich.

Uppercu Corporation, Keyport, N. J.

Viking Flying Boat Company, Municipal Airport, New Haven, Conn. Builders of the Kitty Hawk B-8.

Vought (Chance) Corporation, East Hartford, Conn. Builders of military and naval planes, such as the **Corsair.**

Waco Aircraft Company (The), Troy, Ohio.

Waco Aircraft Co. (The), Troy, Ohio. Builders of the **Waco** line of sportplanes and light military planes.

Wedell-Williams Air Service Corporation, Patterson, La. Formerly builders of the Wedell-Williams racing planes.

Welch (Orin) Aviation School, Portland, Ind. Builders of the **Welch** lightplane.

Weick, Fred E. and Associates, Langley Field, Hampton, Va.

Westbrook Aeronautical Corporation, Hasbrouck Heights, N. J.

White's Aircraft, 17th and Crocker Sts., Des Moines, Iowa.

Whittier (Donald W.), Los Angeles, Calif.

Wiley-Post Aircraft Corporation, Oklahoma City, Okla. Builders of the **Wiley-Post Model A,** sportplane.

High-Lights and Side-Lights

by M. A. RODDY

Brief news notes on aviation activities and upon prominent personalities in aviation who are responsible for the progress of aviation. Readers are invited to contribute news items to the author for publication in this department.

MARKING TIME: While awaiting action on the part of the Senate regarding the Mead bill, Congressman John J. McSwain, chairman of the House Military Affairs Committee, suddenly discovered that there are two kinds of publicity during the hearings which he was conducting on a bill purported to place American aviation in world leadership when he was rebuked by President Franklin D. Roosevelt, who, as Commander and Chief of the Army and Navy, wrote to the "air minded" congressman censoring him for permitting to become public certain military phases of said hearings. From what I am told, Congressman McSwain is not the only one to discover that the witness chair was a "hot seat," for a certain noted pilot's testimony has caused a bit of frowning among some of his company's executives.

* * *

THEY tell me that Postmaster General James A. Farley has not been in the air for two years. . . . That is "physically," as I have no doubt but that the smiling postmaster was "up-in-the-air" during the cancellation of air mail contracts. . . . Although Mr. Farley still refuses to comment, it is no longer a secret around Washington that he will resign from the cabinet some time after Congress adjourns in order to manage the 1936 presidential campaign.

* * *

IN THE meantime, some 50,000 stamp collectors are causing Mr. Farley an attack of philatelic jitters as the result of cancellation difficulties encountered with the Byrd Antarctic Expedition.

President Franklin D. Roosevelt officially welcomed Rear Admiral Richard Evelyn Byrd at a triumphal reception in Washington following his return from 19 months in the Antarctic. . . . It was in May, 1926, that Byrd, accompanied by the late Floyd Bennett, made a 16-hour flight from King's Bay to Spitzbergen over the North Pole and in 1929 he successfully completed an 18-hour hazardous flight over the South Pole. . . . He is 47 years old and he has been awarded the Congressional Medal of Honor and 14 military citations in recognition of his personal bravery and daring exploits. . . . Admiral Byrd plans to "hole up" in Boston for three years and write a 10-volume story of his explorations.

THE MAIL MAN JUST CAME IN, so let's see if he brought any news. . . . Well, it doesn't look like there are any bills, so we'll go right ahead and open them and see what they contain.

Here's the first item telling that Pilot E. B. Jeppesen of the United Air Lines has received one of Walter Winchell's orchids which have become a symbol of heroism and service.

* * *

RECENTLY, while flying his airliner near Lee Center, Ill., Pilot Jeppesen noticed a group of farm

Mussolini takes a profound interest in aviation and makes a practice of taking the controls whenever he takes a trip by air.

buildings flaming in the morning dawn and he zoomed down, turning his engine full blast and succeeded in awakening the sleeping farm families in time to escape from the burning dwellings.

* * *

WHAT'S THIS? Pilot James T. Rinker, copilot on Pennsylvania Airlines, which is flying twin-engined Boeings, has become the father if twins. . . . Tri-motor and clipper plane pilots, take note. . . . Pilot G. J. Ekstrom of the Pan American Airways writes to say that Cap and Mrs. Swinson are the parents of 8-lb. Mary Jane Swinson.

* * *

HERE'S another letter from Pilot Ted Colbert of Braniff Airways describing the dust storms in and around Wichita. . . . Colbert writes that it hadn't rained in so long out there that when a few drops did fall, Dispatcher John Palmer fainted and was revived when the pilots threw a couple of buckets of sand on him.

* * *

IT IS SAID that Berndt Balchen, who flew across the Atlantic and also the South Pole with Admiral Byrd, plans an airline of his own between Norway and Holland and is also reported as the man who will lead Dorothy Burgess to the altar.

* * *

NEW AIR CRAFT: J. P. Ohmichen, French engineer, has designed a type of air craft known as the "Helicostat," composed of an airplane and balloon, which enables a completely vertical ascent and descent as well as permitting the flyer to remain stationary in mid-air. . . . Successful tests have been made at the Orly Airdrome near Paris.

* * *

ENGLAND has perfected a new fighting ship which will revolutionize tactics of aerial warfare. . . . Use of a narrowing fuselage gives machine gunners an unobstructed view and field of fire, eliminating vulnerable "blind spots." . . . However, although it is not generally known, the United States is building a test bombing plane with a promised flying radius of 3,000 miles at 225 miles an hour, carrying 2,500 lbs. of bombs.

* * *

HANGAR FLYING: Lithuanians are planning to erect a monument in Marquette Park, Chicago, as a memorial to their two national aviation heroes, Stephen Darius and Stanley Girenas. . . . Felix Waitkus is planning a solo flight from New York to Kaunas, Lithuania, in June.

* * *

J. M. PENNINGTON, 92-year-old Civil War veteran, was piloted on his first air trip from Chicago to New York by Joe Hammer of the American Airlines. About the same time, Noel A. Mitchell of St. Petersburg, Fla., was revealed by Pennsylvania Airlines as being the man who bought the first ticket on the country's first scheduled air line, which was the St. Petersburg-Tampa Air Boat Line, which started operations January 1, 1914.

* * *

WOODS C. (PENNY) ROGERS flew a student built plane 325 miles an hour at New Orleans, but the mark will not be recognized as Rogers had the advantage of the mo-

mentum of a dive plus a 25-mile-an-hour tail wind. . . . Vance Breese of Los Angeles is awaiting favorable weather before attempting to set a new American speed record. . . . Clyde E. Pangborn with Copilot Bennett Griffin, who made an emergency landing with Jimmy Mattern in West Russia in 1932, after having broken all existing records up to that point, have completed plans for their projected round-the-world non-stop flight in 1935, which will be made during the current year.

* * *

JUAN IGNACIO POMBO, young Spanish aviator, has taken off from London on a 15-stop flight to Mexico City. . . . Charles L. Foley will attempt a substratosphere solo flight from New York to Dublin.

* * *

NILES TRAMMEL, vice president of the National Broadcasting Company at Chicago, and William A. M. Burden, of the New York firm of Scudder Stevens and Clark, have been elected to the directorate of the United Air Lines. . . . Samuel J. Solonom, manager of the Washington Airport, has been appointed to the Airport Committee of the Aeronautical Chamber of Commerce and Milton Reynolds of Chicago has been named assistant to Senator William G. McAdoo, president of the National Aeronautical Association. . . . Lewis W. King has been elected president of the Chicago Air Transport Club, of which John Graves of Eastern Air Lines is vice president and Charlie Hubbard of United Air Lines secretary and treasurer. . . . The club plans to extend its membership to include anyone interested in the promotion of air travel.

* * *

AMERICAN Airlines have signed contracts with three companies for 4,300,000 gallons of gasoline with additional orders to be placed, bringing the year's total fuel supply to 7,000,000 gallons and 125,000 gallons of lubricating oil. . . . Chicago and Southern Airlines have inaugurated night air service between Chicago and New Orleans. . . . Mayor Meyer C. Ellenstein has proclaimed May 15 as Air Transport Day, with appropriate ceremonies at Newark Airport in commemoration of the 17th airmail anniversary. . . . "Maggie," the canine mascot for six years at Newark Airport, who once flew to Chicago with her family of pups, is dead.

* * *

ARMY carrier pigeons are being taught to fly at night for use in war, according to Col. George Chase Lewis, military science professor at the College of the City of New York.

On April 1, 1934, there were 13,886 pilots and 6,855 air craft federally licensed.

* * *

REAR Admiral H. V. Butler and Commander V. F. Grant would make it mandatory for northbound

(*Concluded on page* 64)

Up She Goes!

Here is the pilot balloon about to ascend. By Metropolitan News Pictures, Chicago.

SMALL gas balloons are employed for measuring the altitude of clouds, the wind velocity and air turbulence. As a balloon ascends at practically a constant rate for a considerable portion of its upward journey, timing it with a stop-watch makes it possible to estimate the altitude.

Gets Its Ninth Stripe

STEWARDESS Charlotte Lathrop painted the ninth annual service stripe on the chevron of a Western Air Express plane to celebrate the ninth year of transport service by that company.

The Western Air Express has maintained continuous service between Los Angeles and Salt Lake City without a single casualty for all that period. It has flown more than 13,000,000 miles and has safely carried more than 110,000 passengers. This is a real record and one to be proud of. The gentleman holding the jar of paint for Miss Lathrop, we forgot to mention, is Alvin P. Adams, president of Western Air.

This is the nine-stripe chevron being painted in celebration of the anniversary.

Ice, a Carbureter Problem

AVIATION scientists have tackled a problem heretofore given little attention, that of ice forming a coating inside the carburetor and causing engine failure. This may happen in the summer as well as winter, and there is more than a little evidence that some mysterious air crashes have been caused by it.

Actual proof is impossible to obtain, however, for the very small amount of ice sufficient to cause stalling disappears the moment the engine stops.

The National Bureau of Standards, in a series of tests, finds that fuel volatility, altitude and weather conditions are factors in engine failures of this origin. Gasoline which is highly volatile, like ether or naphtha, absorbs more heat from the carburetor walls, leaving them cold enough for water vapor in the intake mixture to condense and form a coating of ice which grows thicker and thicker until the channel is nearly plugged.

The most satisfactory method of combatting this menace was found to be direct heating of the carburetor walls, either by the exhaust or by an electric coil.

Pilots Need Corsets

ENGLAND is making a determined effort to extend the physiological limitations of flying and one means advanced is an automatic corset for the flyer's use in counteracting the momentary blindness or "blacking out" which occurs when a pilot banks or dives at high speed.

"Blacking out," said Wing Commander G. S. Marshall in a lecture before the Royal Aeronautical Society in London recently, "is due to the anemia of the eye from the pooling of blood in the abdominal vessels, and if the causative force were allowed to continue for, say, ten seconds, it would cause fainting.

A good deal could be done to prevent those effects by momentary bracing of the entire abdomen by use of a broad, flexible corset. Such an artificial aid should operate automatically."

A Slide-Sleeve Engine Appears

A TROUBLE-FREE efficient single-cylinder sleeve-valved airplane engine has just been satisfactorily tested after seven years of experiment by the Bristol company of Great Britain.

The engine has been put through official flight trials and has given an excellent account of itself. It is claimed the engine delivers a higher power output than has yet been recorded for an air-cooled overhead poppet-valved motor of similar type, and with lower consumption of fuel and oil. The number of cylinder components is diminished to about one-eighth of the parts of the poppet-valve cylinder.

The Cheapest Way to Learn

by T-2003

The author, holder of a transport pilot's license and with long years of experience in flying, gives the beginner a few useful tips on the practical side of the game.

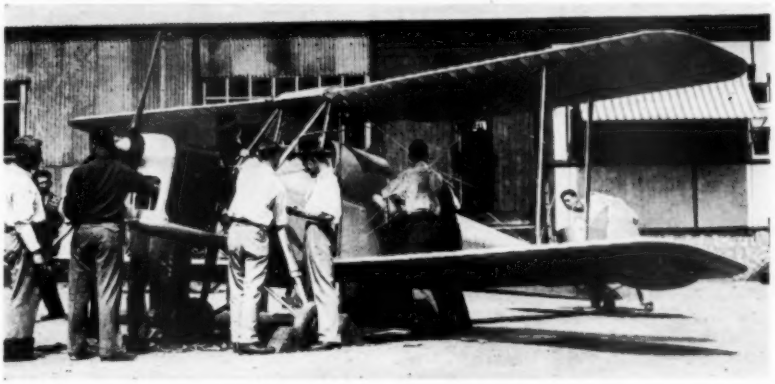
LIVE and learn—and take heed of your own and the other fellow's mistakes if you expect to fly through life with a minimum of busted props, shattered landing gear, cracked ribs (your own and your wings') and those other little annoyances that make one dig down in the old wallet for another handful of currency to set the old bus right again.

Suppose, in this flying game, that all of us had a dozen crack-ups to every single successful flight; we'd then hover around the lad who had done a good day's work in the air without mishap and ask him what he had done to avoid the crack-ups which were the average pilot's daily portions. The reverse is true, however, and dangerless flying is the every day event in the world of aviation, just as good health is that of the average dweller on this troubled earth.

Equally true is the old proverb, "Experience is a dear teacher;" but if certain experiences have cost some of us or our employers dearly, these same experiences, if described in a magazine read by members of the flying fraternity, where we can talk without mincing words, might be the means of considerable savings to said members. Mistakes — sometimes they're "crack-ups"—are so unusual, then, but likewise so annoying that, by describing some of my own and some that I've seen, I may help others avoid the annoyance and cost of the same or similar "boners."

To begin with, I had been soloing for four or more hours before I had done any real taxying. (Those were the good old days, early in 1918.) The ship was a Standard with four cylinder Hall-Scott engine. Having finished my day's flying at noon, the instructor had gone back to the hangar-line and left word for me to taxy the crate in from the stage in the center of the field.

Bravely I started out and immediately she turned around and headed into the wind—just like a weather-vane. With no brakes to aid me, I reasoned that one must give her a good blast of the gun to make her taxy down wind, which I did. That sure did the trick, but I was soon taxying so fast that when I came to the hangar-line, cut the gun and kicked her around, she just ground-looped, dragged the outside wings on the ground and stood up on her nose!



Just gather around and discuss matters with the boys at the field. No matter how good you are, you can always learn from the other fellow's experiences.

The broken propeller and scragged lower wing tip wasn't all. I hadn't used my safety belt and when she upended, out of the cockpit I was flung, to land smack on top of my instructor, who had fearlessly dived toward the melee to help me. Wheel-brakes have made me forget most of my taxying worries and I can forget many things, but not to use the safety belt when it's there, until I'm ready to climb out and call it a day.

And speaking of taxying — another near-jam of mine was caused 14 years later by my ship taxying ahead without my knowledge; I having neglected to pull back on the parking brake-lever when I came up to the line at Omaha and stopped my bus. The engine was idling over, and I stuck my head down in the cockpit, got out the log book and proceeded to enter my time from North Platte to Omaha, with a brief remark on the thunderstorm over Lincoln which had prevented my landing there.

Something suddenly warned me. I looked up quickly and things looked different. Naturally they would, for I was sixty feet from where I had stopped and almost on top of another, and quite expensive, ship also parked on the line. Moral — Don't *ever* go to sleep in a ship, even on the ground.

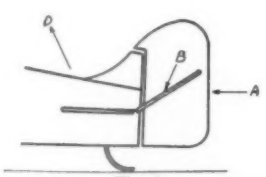


Fig. 1.

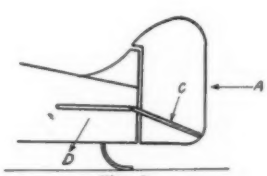


Fig. 2.

These are the diagrams illustrating the tail episode in the article With the flipper down (at the right), the wind tends to hold the tail down.

Incidentally, taxying mishaps are the bane of school operators, including those of the Army and Navy flying schools. Invariably the student exclaims, "And I looked so carefully out of the right side, but how was I to guess that gas pump would hit my left wing," or something of the sort.

Did you know that you sometimes taxi downwind with your stick way forward and the flippers down, to keep from nosing over? Figure 1 explains why this happens when the wind on your tail gets to be 20 miles an hour or more. In this situation it is assumed that you have wheel-brakes to keep the ship's tail up into the wind.

This leads me to thoughts of a summer day in 1926, when black clouds suddenly hove in view and a good old fashioned thunderstorm tore across that part of New Jersey from the Southwest. It was evident that this was to be a real wind. The two pilots on the field, a country fair out in the sticks, acted differently.

Pilot "A" headed his ship into it and staked wings and tail skid down to the ground. Pilot "B" did likewise, but with the tail to the wind. He also threw off the tailskid shock cord, which left the tail down 15 inches or more. When the blow reached 65 miles per hour, "A's" ship tore up her wingstakes and literally took off; falling over backwards on her back when the tail stake held. "B's" bus tore off its rudder and loosened two aileron hinges, but the wind, striking the reverse angle of incidence on wings and tail *from the rear* had a tendency to hold the ship down on the ground and the whole thing only cost him $18.00. Pilot "B," it seems, had been through that sort of thing before.

To go back to 1918 and the precision

landing stage, where we practiced landing for a mark from various altitudes with a dead stick. "At 1,000 feet, if you cut your switch over the red barn outside the landing field, you'll just be right for landing in the circle," my buddy advised me. I followed his advice and landed short in a cornfield not 100 yards from said barn.

The day before, when my buddy was practicing this work it had been dead calm; but the day *I* made a fool of myself, the wind was blowing almost 25 miles an hour. Learning of the reason for my landing so short, my instructor remarked that he saw no difference in what I had tried and in cribbing in an examination. Later, I saw he had the right slant on flying training.

A few weeks later, "Old Precision," as we dubbed one of our fellow cadets, and some more of us were out on spirals. In this stage we went up to 2,500 and with power on and then with power off, spiraled loose, and then tight to a landing in a small auxiliary field. Up went the "precision kid" to a couple of thousand feet, cut his gun and started the tight spirals, down, down in tight and graceful circles and so on—right into the ground!

Well, we dragged him out of the wreck and the first words he said were, "The last I remember is that the altimeter said 550 feet." Whereupon the instructor stormed at the rest of us, "Let me tell you yahoos two things: One is that this field is 550 feet higher than our main field. The other is—don't watch your instruments; watch the *ground*." Old Precision had set his altimeter at zero at the home field and thought he had 500 or more feet to spare when he spiraled into the ground up on that plateau.

"Keeping your eyes on the ground" reminds me of the time a fellow pilot had his eyes too close thereto. Coming in to a strange and muddy field he stuck his head out to one side of the windshield to see that he landed in no deep mudhole. His wheels touched, then "blop" and a huge dab of wet clay picked up by the wheels, socked him full in the face. Blinded momentarily, he ground looped and cracked off a wheel. Warning—beware of mud in the face, although it's apt to be worse in taking off when the fast whirling prop may throw it back hard enough to stun you.

Inertia starters, hand or electrically turned, what a blessing for the lone flyer, the single-handed barnstormer or the like. I remember the incident of the barnstormer who had just picked up a new student at $25.00 the hour. (Ah, them was the happy days of 1927.) Stude sat in blissful ignorance in the front seat. The owner grabbed the prop, gave her a few turns to suck in gas, walked to his cockpit and retarded the throttle and put the switch "on," then walked back and snapped the prop over.

(*Concluded on page* 56)

Delay Chart Shows Extent of Loss

CAPT. Eddie Rickenbacker, general manager of Eastern Air Lines, gives the following as a typical example of telephone calls received almost daily at various airports.

"Hello! Eastern Air Lines? Good. This is Mr. John Q. Public speaking. I find that I may be a bit late arriving at the airport. Will you please hold the plane a few minutes? The pilot will easily make up the lost time."

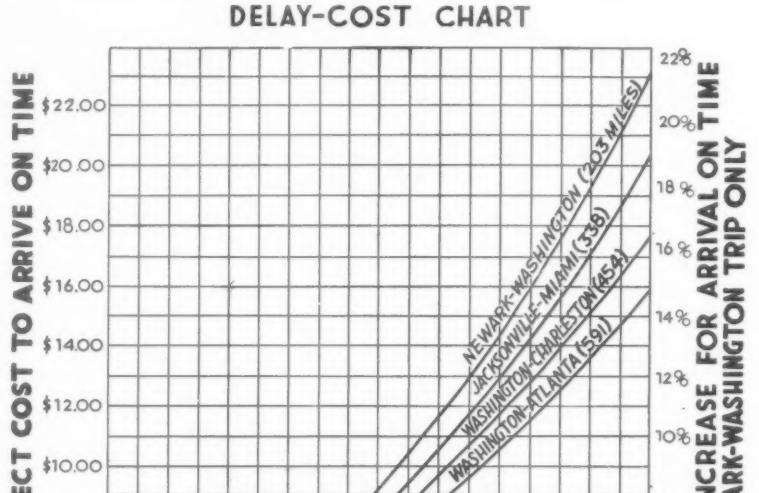
Chief Engineer Eddie Allen therefore developed the accompanying Delay-cost Chart, which is excellent proof of just why plane departures must be made on scheduled time. Based on the Newark-Washington passenger and mail nonstop flights, the chart shows actual dollar-loss and percentage of increased horsepower necessary to make up from one to nine minutes' delay at ground stops.

Departure three minutes late from any station requires the use of a 5 percent. increase in power on a 300-mile flight. This is an additional cost of $5.50. A seven-minute delay on a 200-mile flight necessitates using 15 percent. more power at an additional cost of $16.00. For instance, on a 200-mile flight a departure delay of six minutes costs an additional $13.00 or the entire revenue derived from transporting one passenger that distance. Engine operating costs increase in direct proportion to power increase. Overhaul costs, wear and reliability suffer in even larger proportion.

But even though the delay may very greatly increase the mechanical charges, they also increase the overhead expenses in a like degree and these charges are additional to the costs shown on the chart. Lost time costs money wherever mechanical equipment is concerned whether it be an airplane, a drill-press, screw-machine or printing press.

In short, there is a heavy investment in the transport planes and this interest runs up to a surprising amount in 24 hours. Again, the insurance runs on and on whether the plane is in action or not. Then there are the many taxes leveled against the equipment which run on and on whether the plane is waiting at the airport or in flight.

In other words, the plane must fly with a good payload as many hours as possible and it cannot pay off fixed charges while sitting on the ground. It is for this reason that many taxicab companies and trucking concerns run their cabs and trucks 24 hours per day.



This chart shows how much a trifling delay may cost an airline operator in dollars and cents. For example, the chart shows that a nine-minute delay on the Newark-Washington run may cost $23.00 and increase the power about 21.6 percent.

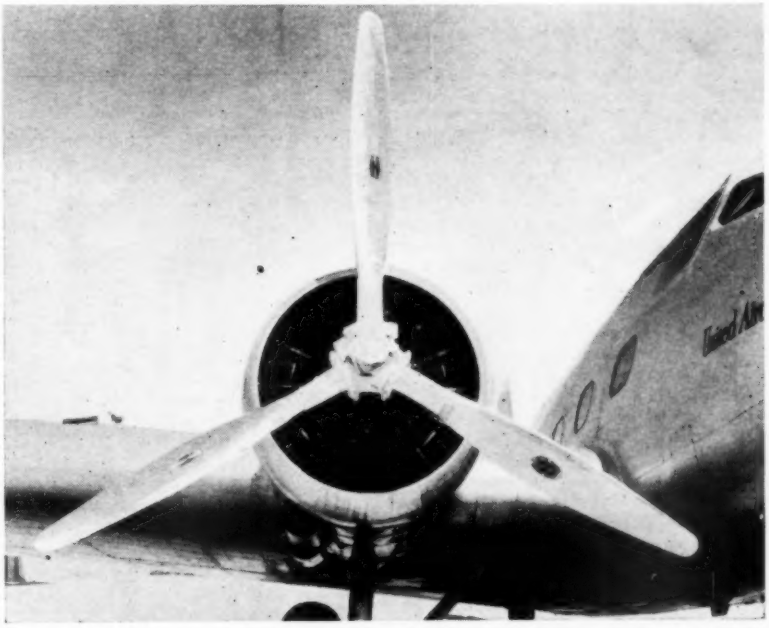
Variable Pitch Propellers

by HAROLD GIBBONS

This is a simple and easily understood account of the purpose for which variable pitch propellers are intended and how they function on a plane.

MUCH of the performance improvement with modern planes is due to the use of variable pitch propellers by which the blade angle can be adjusted to meet varying flight conditions.

But, as with many other items in aviation, the variable pitch idea is not new for an automatic variable pitch propeller was used way back in 1910 by Louis Breguet with good results.



This is a variable pitch propeller of very recent design. It is not only a variable pitch propeller but it is also provided with an automatic governor so that a constant engine load is maintained.

DESIGNED to give maximum efficiency in take-off and climb performance, with swiftest possible cruising speeds, the variable pitch propeller has been of outstanding importance in making possible the "modern" airplane.

It is in this field of modern airplane performance where its contribution to the aeronautical sciences is most evident especially when its advantages over the fixed-pitch type are shown in comparison.

One of the chief reasons for loss in performance of airplanes is because of the employment of a fixed-pitch propeller. There are certain restrictive laws which govern the design of the fixed-pitch type and efficiency in one kind of performance has to be sacrificed to obtain maximum efficiency in favoring one other particular type of performance.

The fixed-pitch propeller has to be so set and so designed that the engine will turn over at its rated r.p.m. in full-throttle level flight. This is necessary to prevent overspeeding of the engine which would result in undue wear and repairs.

When the fixed-pitch propeller is used in this way (the only way it should be used), it holds the engine down to about 80 percent. of its normal r.p m. and therefore 80 percent. of its normal power output when on the ground at time of take-off. This is due to the fact that the density increases as the altitude decreases and the engine and the propeller have a greater "biting impact" to overcome. An engine rated at 365 h.p. would then only develop about 292 h.p. at the take-off.

This loss in power is avoided by the use of the variable propeller, since the pitch can be adjusted so that the engine revs up to its normal r.p.m. and power output for take-off and climb as well as for maximum speed and level flight. The take-off is also shortened which is a distinct advantage.

During the climb, the power output will be around 85 to 90 percent. of the normal power output which would be about 328 h.p. For example: If a fixed-pitch propeller is used on a plane and the normal power output is 100 h.p., then only about 80 percent. of this or 80 h.p., is available. The rate of climb of an airplane =

$$\frac{\text{Reserve H.P.} \times 33{,}000}{\text{Gross Weight in Pounds}}$$

The reserve power is the difference between power required and power available and if this amounted to 72 h.p. with the fixed-pitch propeller, the rate of climb would be around 2,870 ft./min. On the other hand, if a variable propeller is used the reserve power would be 92 h.p. and the rate of climb would be increased to 3,670 ft./min. at sea level.

A difference of 800 ft./min.! In both cases the gross weight of the plane is 828 pounds. We see the tremendous increase in the rate of climb even with such a simple equation.

Engines have a certain maximum speed for cruising and a certain maximum safe power output at that r.p.m. These limitations on power output are brake mean effective pressure, b.m.e.p., and r.p.m. and are set by the engine manufacturer. See Fig. 1.

b = Span, in feet
S = Area, in square feet

or, $b = \sqrt{S \times AR}$

Then, for the monoplane:

$$b = \sqrt{150 \times 6} = \sqrt{900} = 30 \text{ feet.}$$

Varying altitudes of air densities cause the fixed propeller to allow the engine to turn at a much higher r.p.m. with a given b.m.e.p. than it would at lower altitudes. For example: if such a propeller were at 20,000 feet altitude, it would turn about 40 percent faster than it would at ground level. Therefore, if a fixed propeller is set for cruising at the proper r.p.m. and b.m.e.p. at a given altitude, it would rev too slowly at ground level, causing a loss in engine power which is added to the loss between the maximum speed of the plane and the conditions of take-off and climb.

For a plane of this kind the two pitch positions may be used very effectively by adjusting the high-pitch setting for r.p.m. and b.m.e.p. to be used at altitude and by adjusting the low-pitch setting to suit the take-off and climb.

The performance of all the modern high-speed and racing planes is dependent upon the propeller. Very high speeds, especially in conjunction with geared engines, bears a definite effect

(*Concluded on page 59*)

Here and There

GRETO GARBO, the ever famous movie star of Sunny California, has said for the last time, "I want to be alone." The sound men on the lot have chipped together and bought her a stratosphere balloon. Out at the Airport the other day, I ran into Eleanore Jones, that swell looking Gal from the National Aviation club. She had, with her, the funniest looking dog I ever saw. She informed me it was an aviation dog and seemed to take a liking to all flyers; it was especially fond of Post.

* * *

I think the meanest guy in the world is the fellow that talks his flyer-wife into going up on an endurance flight and then runs to court for a divorce on desertion while she's up.

* * *

I was explaining Wiley Post's continental stratosphere flight to little Jimmy Zilch the other day. I said, "Yes, Jimmy, he dropped his landing-gear when he got off." Jimmy stood up, yawned and said, "I see. And when he got to New York, he belly-flopped, that's not a bad idea." After that crack, I don't think it would be a bad idea for some doctor to invent a way to have children skip the ages from two to fourteen.

* * *

Speaking about shortening wings the way they are on some of these little racing jobs, I wouldn't be surprised to see some guy walk out and strap a saddle on a motor one of these days.

* * *

Little Sammy was an up and coming young man and someone had whispered in his ear that aviation paid big salaries with long contracts, so Sammy went out to the local port to take his first lesson. His instructor went around front to spin the prop; after giving the prop several turns he shouted "Contact." Sammy fell out of the cockpit and broke his neck. His dying words were, "I thought for sure somebody said Contract."

* * *

Out at the Pal-Waukee Airport, the manager of the Goodyear blimp ground crew tells me he can always tell when the blimp is going to land 'cause the co-pilot drops him a line.

* * *

George Vest, the local D. of C. man, says "anytime you think Vest gets all the gravy, you're sadly mistaken." Speaking about officials, there's a certain ex-state aeronautical inspector who made the crack that lightplanes and gliders make his teeth itch. I could give him the names of plenty guys that would gladly scratch them for him.

* * *

Chicago's municipal airport, the undisputed hub of all airlines, is really a thing of beauty, a perfectly synchronized wheel of modern transporta-

(*Concluded on page 52*)

Model Glider Contests—Here and Abroad

A lot of small boys and tremendous model gliders mark this European model glider contest. Unfortunate is he who gets socked on the bean with one of these creations.

IT IS always quite interesting to compare the difference in methods and fashions as followed in this country and in Europe. Nothing can be more strikingly different than the model glider contests held in Europe and the U. S. A. as set forth in the two accompanying photographs.

To judge from the photos, our European model boys go to a whole lot of trouble in building their very elaborate model gliders—almost as much work as building a scale model airplane. And further—they seem to affect a sort of club uniform in which the most conspicuous feature are bare knees. Nothing, however, is said about the record hung up during this contest.

Now, as a contrast, we look at the two American boys, just fresh from their contest but with no frills apparent. Edgar Fulmer, Pittsburgh, Pa., shown at the left, is showing his winning glider to Walter Getsla, Chicago. Edgar won first place with his exceedingly simple and almost primitive glider when it remained in the air for 41.9 seconds. Walter Getsla's glider brought him second place with 41.6 seconds, a mighty close thing.

This is splitting seconds with a vengeance.

Edgar Fulmer, left, shows his winning model glider to Walter Getsla, Chicago. Edgar got the first prize with a duration of 41.6 seconds.

What Our Readers Are Building

Here we show the various types of aircraft, built and under construction, that are being produced by our readers. We solicit photographs of your job with a short description attached so that your fellow constructors can see what you are building.

AFTER a few months absence, this department is reporting back for duty again and we are glad to get it back because many of our readers are much interested in what their fellow lightplane fans are working on or have worked on.

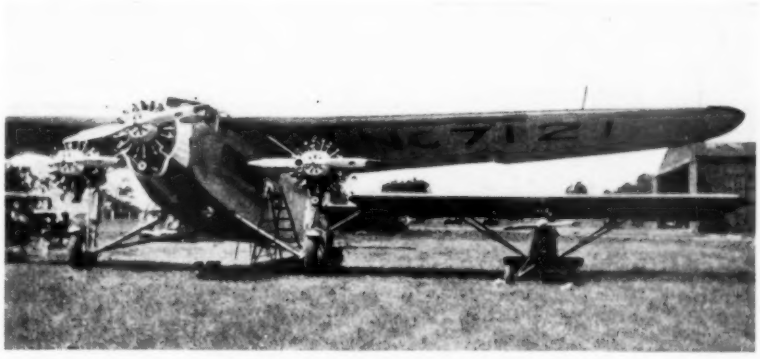
We open the program with a most striking picture, a lightplane built by Robert R. Burge, 2560 Robinwood Ave., Toledo, Ohio, standing completely under one wing of a trimotor transport. Mr. Burge said that he soloed on this ship and test-hopped it at the same time, which proves that it is a stable well balanced little ship. He has built up 90 hours in this lightplane and then—John H. Law stepped in and stopped him.

And now comes the race-plane built by Aldo Ambrosini, 2304 Butler St., Chicago Heights, Ill., a snappy little bus we should say. It took two years of Aldo's spare time to design and build it but, now that she is finished, all of the hard work and long hours are forgotten. The span is 14 feet and it is powered with a Heath-Henderson engine. While he has not yet had time to test her out, all of his pilot friends assure him that she will "take it with a smile" when he pulls the throttle open.

John R. Dowalo, 144 Thompson Ave., Donora, Pa., kindly sends a photograph of his modified Pietenpol two-place dual-control ship which he built, assisted in the later stages by Mr. P. Fantone. It is powered with a 6-cylinder, 60 h.p. Anzani radial engine, and it only remains for the owner to discover another spot, more favorable than his own state, to try her out. Mr. Dowalo is proceeding cautiously with his test-hop arrangements, for a previous flight on another unlicensed craft cost him $55.00 and 30 days. The 30 days mentioned in his letter undoubtedly refers to the hoosegow, although he does not say this. Annywhoo, he is still on the lookout for a friendly terrain on which he can do more with his pet than to try out the landing gear as he is now doing.

This plane is provided with a detachable engine mount welded out of chrome moly tubing. And while the photograph shows exposed wheels, the wheels are now completely enclosed in pants. The pants, he says, add materially to the appearance of the ship but, of course, he does not know how they affect the performance. The 60 h.p. Anzani engine whirls the 6'-9" propeller at 1,625 r.p.m. on the ground. The motor, as you will see is enclosed in an N.A.C.A. cowling which should be the last word in improvements.

Three Fine Examples of Our Readers' Work



David and Goliath! Mr. Burge's little ship standing under the wing of a mammoth tri-motor with a lot of room to spare. Does the tri-motor make the lightplane look smaller or does the lightplane make the tri-motor look larger?

This hot looking little racing plane was designed and built by Aldo Ambrosini who promises to give us some dope on its performance as soon as she is test hopped. This is sure a clipped wing job.

Mr. Dowalo kindly sends us this photograph of his modified Pietenpol monoplane which is powered with a 6-cylinder air-cooled Anzani engine. This ship has a detachable engine mount which simplifies repairs and adjustments.

XUM

This Is the Offshoot of the Glider

Here is the Kronfeld lightplane making a landing at an English airport. Note the two-cylinder opposed engine above the wing.

OVER in England, the aviation fans are greatly interested in a new lightplane that is the development of glider experiments by Robert Kronfeld, the celebrated glider expert.

Probably, the most astounding feature of this little ship is the fact that it is propelled by a four-horsepower engine, which gives it a speed of 75 miles per hour. The accompanying photograph shows the midget taking off on its test flight, the lightest powered flying craft since the time of the American, Matthew Sellers and his miniature quadruplane. Not much data has been released concerning the details of construction, but it is said on good authority that Kronfeld intends to put the ship into production within a short time.

In many respects, this Kronfeld production greatly resembles the type of craft known in America as a "powered glider," and which failed to register much popularity on this side of the water. To our mind, it is not up to the diminutive Dewoitine in design or appearance.

New Air Corps Rule

AFTER a period of five years, during which time West Pointers only were taken into the regular Army Air Corps, the War Department has again opened the exclusive commissioned ranks of its flying corps to ex-flying cadets who had had to be content with a reserve commission and an all too short tour of temporary active duty with some squadron.

Several hundred vacancies will be turned over to the Air Corps to fill from among the best of the many hundred eligible reservists. The news has awakened interest among young civilians who had never hoped to be able to crash the gates of the regular Air Corps after they had completed the Flying Cadet course.

It will also give the Squadron Commanders a draft of young officers who are crack pilots and many of whom had taken engineering degrees in the colleges they attended before flying for Uncle Sam.

With hundreds of new ships on order this move of the War Department will answer the questions of the old timers in the Air Corps,—"Nice crates,—but who's going to fly them?"

We still have hopes, however, that more young men now in private life will be given an opportunity to train in the Air Corps.

GLOSSARY OF WORDS, TERMS AND PHRASES—DIC-A-63

Bus. A conveyor or a conductor.

Busbar. A heavy electrical conductor, usually a copper bar.

Bush. To fit or install a BUSHING.

Bushing. (1) A piece used for filling a gap between two parts, usually the ANNULAR space between a shaft and the main bearing. (2) A hollow cylindrical sleeve of bronze, babbitt or other ANTI-FRICTION metal employed as a bearing for the support of a rotating shaft.

Bushing (Bearing). See BUSHING—2.

Butt. To place end-to-end or edge-to-edge.

Butt-riveted. A joint in which the plates to be joined are placed edge-to-edge, rivets through a cover-plate holding these parts together.

Butt-weld. A joint made with the edges of the parts together and welded along the joints.

Butterfly-valve. A valve having a circular disc or damper turned around its diameter so that it can be quickly opened or closed. Often used as an engine throttle valve.

Buys-Ballot's Law. A meteorological law that indicates the location or direction of a low-pressure area. "When facing the wind in the Northern Hemisphere, the low-pressure area lies to the right. The high pressure to the left."

Buzzard. A scavenger bird noted for its remarkable soaring ability. It is a member of the genus Buteo.

Buzzer-transmitter. A simple radio transmitter with a short range, in which an ordinary buzzer or electrical vibrator produces the electromagnetic radio waves, by opening and closing a circuit containing inductance and capacity.

B. W. G. (Abbrev.) Birmingham Wire Gage. Frequently used for iron and wire or plate.

"BX". Flexible metal armor for electrical wires.

Byproduct-gas. A liquid fuel produced as a byproduct of the coking ovens. See BENZOL.

GLOSSARY OF WORDS, TERMS AND PHRASES—DIC-A-64

C. Chemical symbol for CARBON.

C°. Abbreviation for CENTIGRADE scale for thermometers. Example, 25°C., or 131°C., etc.

Ca. Chemical symbol for CALCIUM.

Cabane. A pyramidal or prismoidal framework for supporting the center-section of the wings which extends upwards from the FUSELAGE.

Cabane-strut. A strut or structural member extending upwards from the fuselage for the support of the center-section of the wings. Prior to the war, this included the bracing struts then placed above the wing.

Cabin. An enclosed space on an aircraft for the protection of the passengers, pilot or cargo. This word is generally preceded by the name of the purpose to which the cabin is put, passenger cabin, pilot's cabin, etc.

Cabin-plane. A type of airplane provided with a cabin or enclosure for the passengers, pilot and cargo.

Cable. A rope made by twisting a number of wires (strands) together. A cable of given strength is more flexible than the equivalent single "solid" wire.

Cable (Aircraft). A rope made up of high-tensile strength steel wire strands. Used as a tension member in the airplane structure.

Cable (Armored). Insulated copper electrical wires protected by an outside metal sheath.

Cable (Electric). A rope of fine copper wires for an electrical conductor. More flexible than a solid single wire.

Cadmium. A white silver-like elemental metal that resists oxidation and corrosion.

Cadmium Plating. A protective coating of metallic CADMIUM placed over iron or steel.

Cage. An enclosure, generally made of wires or bars.

Cage-aerial. A radio aerial system or ANTENNA, consisting of a series of parallel wires connected together at both ends and arranged around a circular support.

Cage (Electrical). A space surrounded by wires or sheet metal that is shielded from external electrical influence by grounding the cage.

Flying Gasoline Driven Models

by FRITZ AAKEN

Experimenting with and building gasoline engined models is the sport of kings. Somewhat more expensive than flying rubber motored models, but it is a whole lot more exciting, interesting, and satisfactory.

ABOUT two months ago, we put a notice in the "Airy Chat" to the effect that we would like to have our readers submit pictures and descriptions of the gasoline engine powdered models that they had built or flown.

In this issue, we take great pleasure in presenting the first of the models entered in reponse to this request and we trust that there will be many more to follow. But—remember, that you must do your share to maintaining this department. We can print only what we receive and if we don't receive any dope on this subject, then we can't print any. So please send in these photographs, a description of the ship and remarks on its performance.

Standing at the top of the list is a beautiful gasoline driven scale-model, the first scale-model by the way, to be driven by a 1/5 horsepower Midget gasoline-engine. This is a model of the Boeing F4B4 Navy Fighter built to one-fifth scale, and has a wing span of 68 inches. Weighing only 3.25 pounds, it has a flying speed of 30 to 40 miles per hour and a landing speed of 10 m.p.h. It has a duration up to 15 minutes, depending upon the amount of gasoline in the tank.

And next comes Frank Miller, 2105 Moyer St., Baltimore, Md., with an eight foot span gasoline driven model, powered with a Brown, Jr., engine. It is of the all-balsa type construction, covered with Nainsook and equipped with dural fittings, cowling and struts. It has been test flown for three minutes and has proved very stable in flight. We can bet that the boys got a lot of kick out of this job and trust that they will continue to fly her without more than their share of crackups.

Gerard Smith, 398 7th Avenue, Brooklyn, N. Y., now takes our attention with the excellent gasoline driven monoplane on top of the next page. He says that his ship won the first prize at the first All-Gas-Model contest held at Caldwell Airport and that it has outflown every model with which it has come into competition. The competitors so far have numbered about twenty-five in all. This should be an inspiration to the rest of the gas fans to do some more development work along these lines and to hold some more All-Gas contests.

Next on the program comes the fine entry of H. O. Buckey of B. G. Model Aircraft, 409 South Highland Avenue, Baltimore, Md. This is a fine appearing job and, while the writer has not yet seen it perform, he must declare

No, this is not a real full-sized Boeing F4B4. It is a gasoline driven model built by one of our readers that is so carefully built that it looks like the real thing. The constructor failed to sign his name so we cannot give him the credit that we would like.

Frank Miller built this nice looking gasoline-engine propelled model. It has a span of eight feet and is powered with a Brown, Jr., gasoline engine. It has proved very fast and stable in flight.

Here is another view of the Miller job which we could not resist publishing. It shows a gang of admirers grouped about the Miller job who are evidently getting a big kick out of the ship and its performance.

XUM

that he is highly in favor of the decorative features as displayed in the photo.

But here comes the shock. Mr. Buckey's gas powered model is of the all-metal type, probably the first all-metal job of this sort that has been built. It was developed in 1930, which speaks highly of the pioneering spirit. It is powered with a Brown, Jr., engine and shows excellent performance.

Now, fellows, this is just a little starter for what we hope will be a big and flourishing department in P.A. What you have seen here is only a scratch on the surface of our possibilities. Look how the department, "What Our Readers Are Building," has held up through all these years. The light-planers have always come across with the dope, sometimes compromising themselves, so the gas-model boys should surely come to bat.

END.

Mr. Buckley's all-metal gas powered model.

Here's the prize winner, built by Gerard Smith, with 25 wins to its credit.

Torsional Tests on Army Propellers

from the Air Corps News-Letter

DURING the past several years, the Air Corps Materiel Division, Wright Field, has been active in the study of crankshaft torsional vibration in both in-line and radial engines.

The ill effects of resonant vibrations are well known when they affect instrument readings, vibrate fuel lines and cause fatigue failures of engine mounts. However, when resonance occurs between the moving engine masses and the propeller, very little effect is noticeable to the pilot.

For this reason, it is possible to operate an engine unknowingly in a resonant period for long intervals of time. The result is galling of the propeller cones and, in extreme cases, failure of the crankshaft or propeller because of the very high stresses set up.

It was necessary, before a remedy could be found, to develop a convenient means of recording the vibrations of the crankshaft while the engine is under load comparable to that of a propeller in the air. The development of a suitable instrument has covered a period of six years, during which time many possible methods were considered or tested.

The final result is the Materiel Division Torsiometer now used by the Army and Navy and the large manufacturers of Air Corps engines. This device consists of a driving member adapted to engage the starter jaw of the engine, and a spring-driven flywheel whose rotation is sensibly constant. The relative torsional motions of the driving member and the constant-speed flywheel are utilized to actuate a stylus which rotates with the flywheel.

The stylus thus draws a graph of torsional displacement vs. time. These records reveal the frequency and amplitude of torsional vibration and enable accurate determination of the critical resonant range of the crankshaft.

It has been learned that an inline direct drive 6-throw crankshaft, such

(*Concluded on page* 54)

Our Photo Phans Answered

WE HAVE had a lot of answers in response to our request regarding the warplanes on page 376 of the June issue. As usual, there were forty-'leven disagreements and only one reply was anywhere near the truth. We congratulate Elmin Mikolv of South Bend, Ind., for a 100 percent. answer.

During the Big War, when development was at a high pitch, standard designs would be changed around slightly to sub-designs in which the changes were not always apparent from an outside inspection.

This was due to the nature of the alteration, which might be internal and beneath the covering, or it might be done simply for the purpose of confusing the enemy. The Department of Aeronautical Cognizance filed hundreds of records of this sort. Just funny little changes in type to fool the other naughty boys.

But to get back to our subject, we wish to give the real type names prepared from records. The real names and code insignia are as follows:

TOP PICTURE—Macci-Nieuport 17 c. I. The Macci concern was a Nieuport licensee.

CENTER PICTURE—S. I. A.-9B. with a six-cylinder Fiat engine.

BOTTOM PICTURE — A Caproni triplane of which two were built. This carried the mark C A 4.

All right, boys, we thank you for your earnest endeavors and when you get out the old lead pencil, just mark the pix as denoted above.

Illegal Acrobatic Flying

ACROBATIC flights, in which airmen violated the Air Commerce Regulations, cost 23 pilots their lives in the last six months of 1934.

Studying the accidents occurring in miscellaneous flying operations during that period, the Bureau of Air Commerce, Department of Commerce, found that there were 90 pilot fatalities, that 30 of these occurred in acrobatic flying, and that 23 of these acrobatic flights were direct violations of the Air Commerce Regulations.

Eight of the pilots who were fatally injured while engaged in illegal acrobatics were unlicensed. Most of the others held licenses in the lower grades —student, amateur or private—and had relatively small totals of accredited flying time.

Acrobatic flying is permitted by the regulations, provided the pilots observe the prescribed safety precautions. Outstanding among the violations which took place in acrobatic flying during the last half of 1934 were: Performing acrobatics at low altitudes, performing acrobatics without parachutes, and acrobatics performed by unlicensed pilots in licensed airplanes.

Model of the Morane-Saulnier

by

PAUL W. LINDBERG

Model editor and model designer for
POPULAR AVIATION

If you don't think that this model is a perfect replica of the full size machine, examine the front cover or the article on page 25.

WITH the warm weather here, naturally we want to be outdoors with our flying scale models. You will learn that the design of this model is drawn not only to obtain an exact scale model but a remarkable flyer as well, due to its extremely light method of construction.

Our laboratory tests of this model are outstanding. Many flights of over eight hundred feet are on record.

COLOR SCHEME

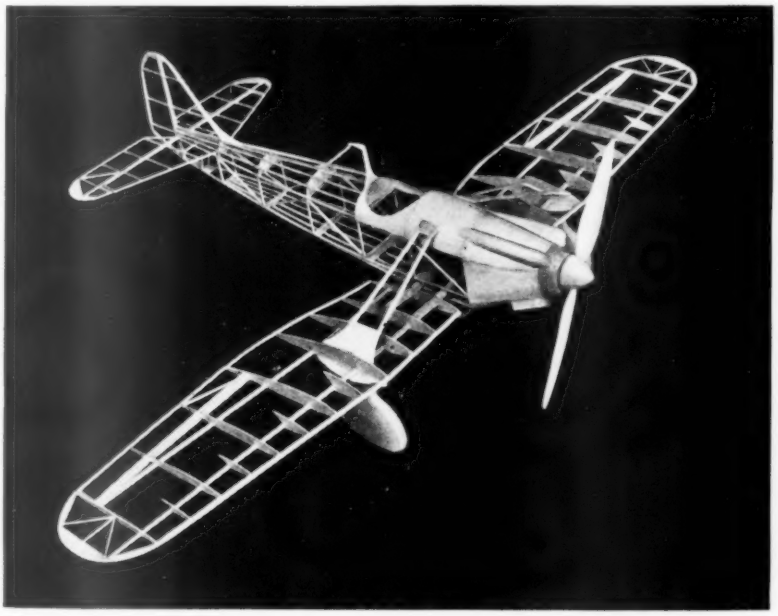
Fuselage, natural white; cowl and head rest, stiff paper, painted silver; wings, wing struts, elevator and rudder are also natural white tissue; landing gears, radiator, oil coolers and wing fillets, silver. Details, black and silver with exception of the French insignias, which are clearly described on plan.

CONSTRUCTION OF FUSELAGE

First, place waxed paper on top of plan to prevent parts from sticking to plan. The fuselage sides are built from 1-16-inch square balsa. The longerons, verticals, diagonal braces, etc., are held in place until securely cemented by inserting straight pins on either side of strips wherever needed. When the two sides are completed, the cross-members are cemented into their proper locations. Check carefully front to rear for alignment.

Cut the formers from 1/32-inch sheet balsa and cement in their respective positions as shown on the plan. The position of all stringers are clearly shown on the formers. See plan. Work stringers from front to rear and check carefully to see that they have the correct spacing. Stiff paper is used in covering the front part of cowl back to and including pilot's cockpit.

Four pieces of stiff paper are required between nose block and formers F-1 and F-8. A separate piece is used from F-1 to F-2, also from F-2 to F-3. Cylinder head fairings are clearly explained on plan.



Here, the internal organs of the Morane-Saulnier are exposed.

CONSTRUCTION OF THE WINGS

Cut all ribs from 1/32-inch balsa. Pin the spar in position on the plan Now, cement ribs in their proper locations. The leading and trailing edges are cut and sanded to shape and cemented to the ribs. The panels carry movable ailerons which are a great help in controlling the flights. Make wing tips from 1/16-inch thick balsa. We highly approve of this type of wing tip, because it is much easier to construct and neater in appearance.

ELEVATOR AND RUDDER

These are built from 1/16-inch square and flat balsa, and are constructed on the plan. Their construction is very simple, therefore no difficulty should be encountered here.

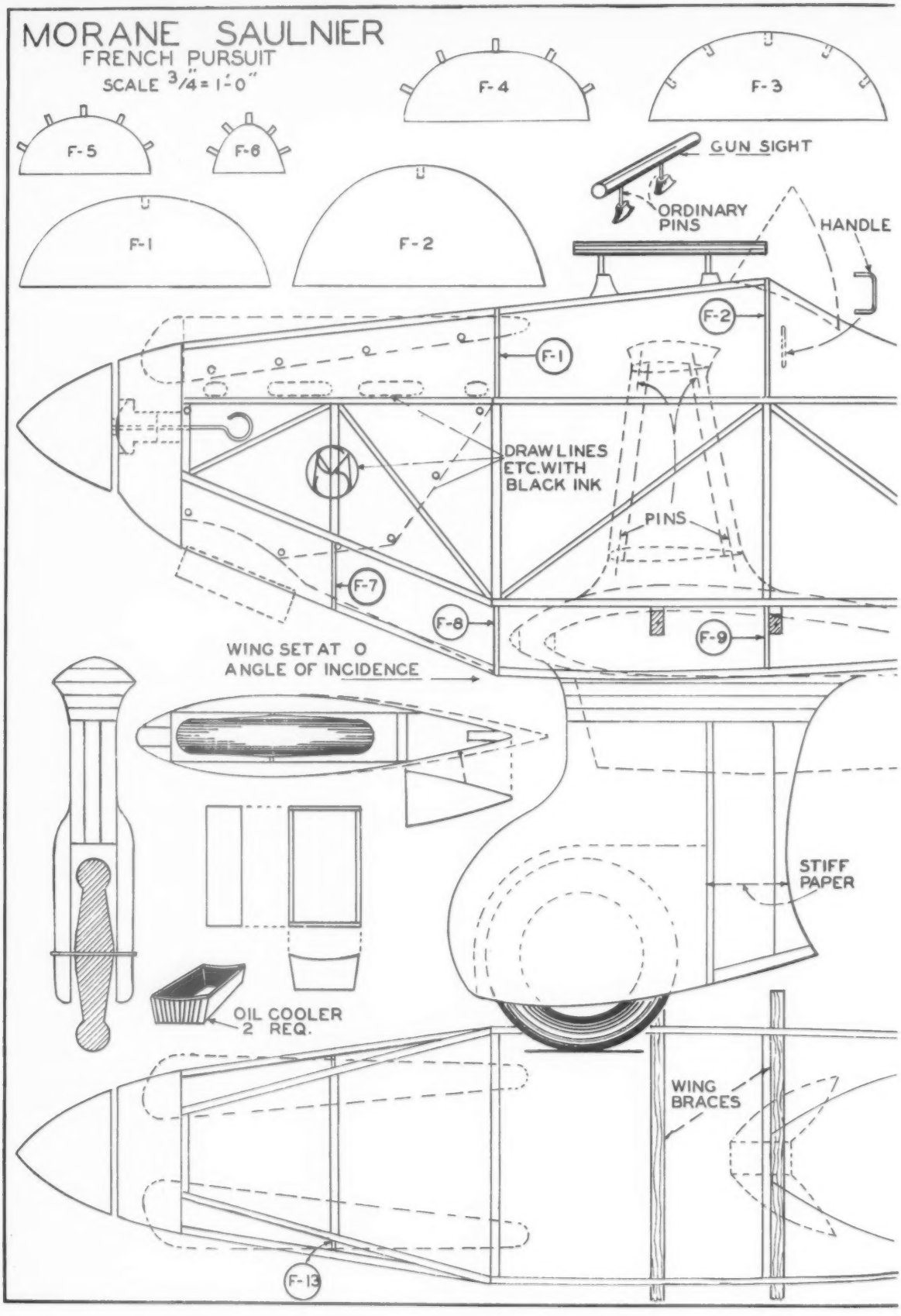
FILLETS

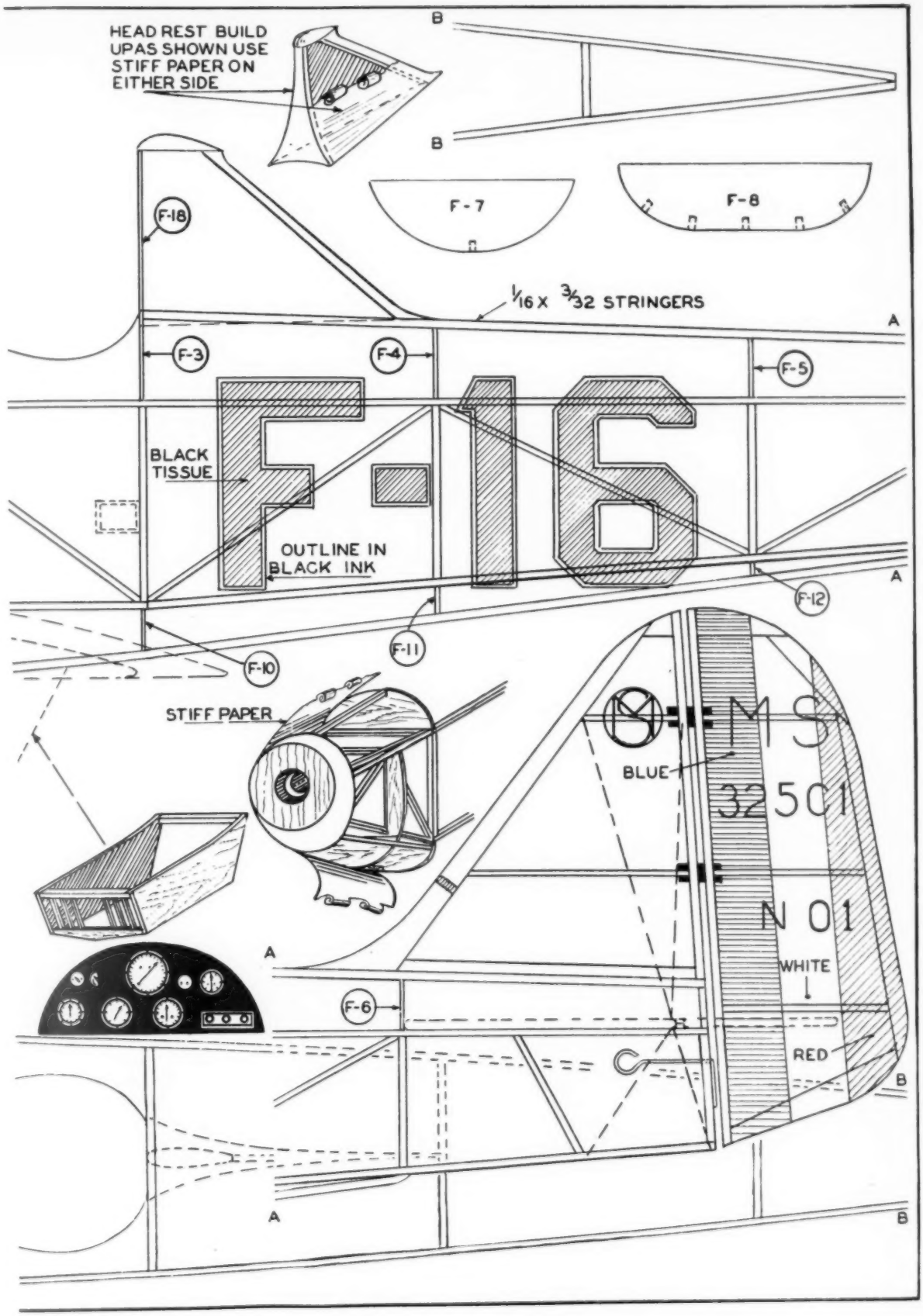
We have eliminated carving of balsa wing fillets and have used in place stiff paper wing fillets. A full size template is shown on plan.

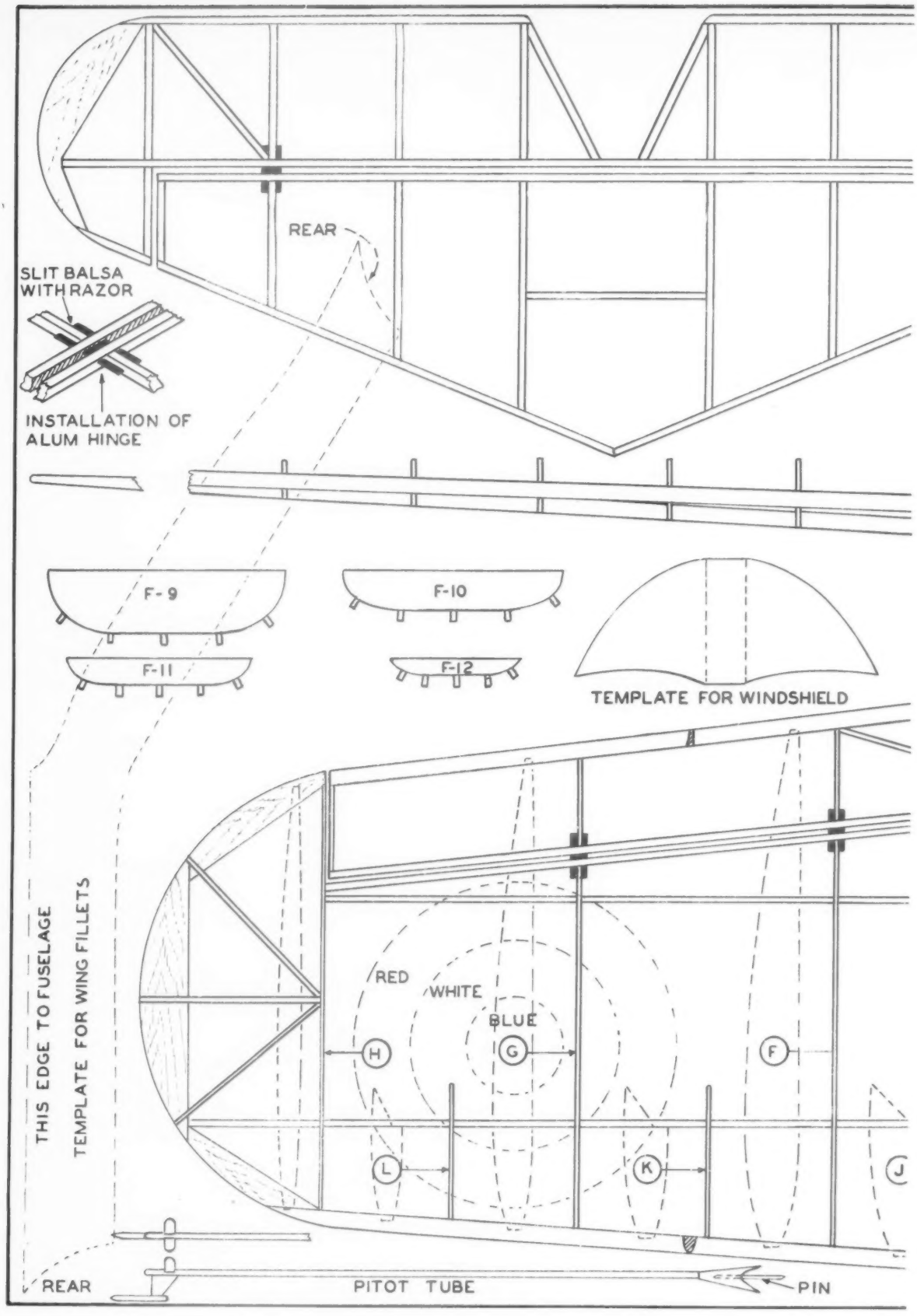
LANDING GEAR

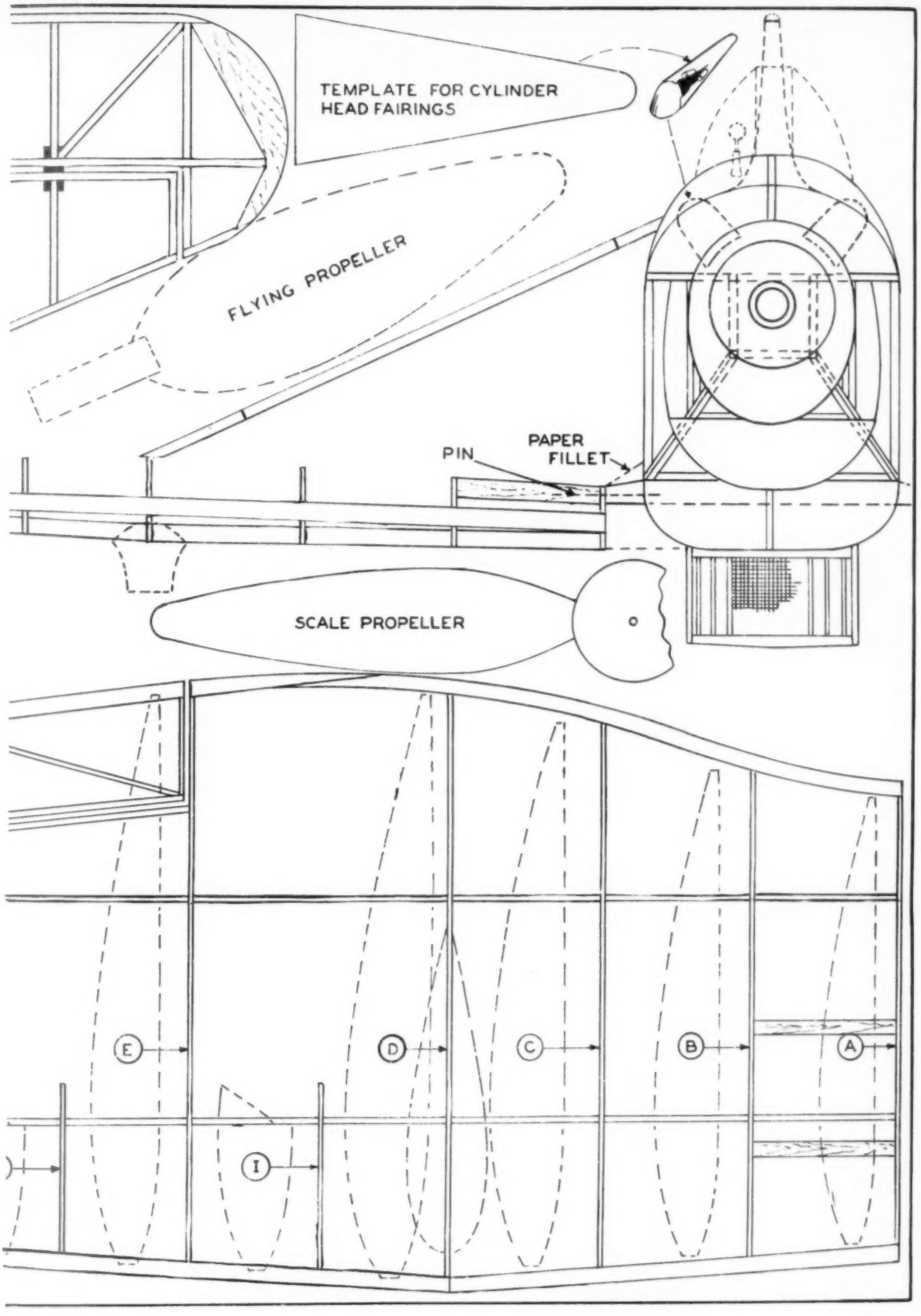
Built from 1/8-inch flat sheet balsa. A

(*Concluded on page 56*)


MORANE SAULNIER
FRENCH PURSUIT
SCALE 3/4" = 1'-0"
F-4
F-3
F-5
F-6
F-1
F-2
GUN SIGHT
ORDINARY PINS
HANDLE
F-2
F-1
DRAW LINES ETC. WITH BLACK INK
PINS
F-7
F-8
F-9
WING SET AT 0 ANGLE OF INCIDENCE
STIFF PAPER
OIL COOLER 2 REQ.
WING BRACES
F-13


HEAD REST BUILD UPAS SHOWN USE STIFF PAPER ON EITHER SIDE
B
B
F-7
F-8
F-18
1/16 X 3/32 STRINGERS
A
F-3
F-4
F-5
F-16
BLACK TISSUE
OUTLINE IN BLACK INK
A
F-12
F-11
F-10
STIFF PAPER
BLUE
MS
32501
N 01
WHITE
A
F-6
RED
B
A
B


REAR
SLIT BALSA WITH RAZOR
INSTALLATION OF ALUM HINGE
F-9
F-10
F-11
F-12
TEMPLATE FOR WINDSHIELD
THIS EDGE TO FUSELAGE
TEMPLATE FOR WING FILLETS
RED
WHITE
BLUE
H
G
F
L
K
J
REAR
PITOT TUBE
PIN


TEMPLATE FOR CYLINDER HEAD FAIRINGS
FLYING PROPELLER
PIN
PAPER FILLET
SCALE PROPELLER
E
D
C
B
A
I

Here's the Pusher Plane Ordered by the Bureau

This is a front view of the wind-tunnel model of the little pusher-planes recently ordered by the Bureau of Air Commerce.

HERE'S a plane anyone can fly. It won't spin. It can't nose over on landing or taking off. It lands cross-wind as well as against wind, and at any speed from 35 miles per hour to 110. Brakes, that work at all speeds, prevent it from hitting obstacles it can't clear when trying to take off. No one can walk into the propeller accidentally. In fact, it's a fool-proof plane.

Twenty-five of these little pusher monoplanes have been ordered by Uncle Sam's Bureau of Air Commerce, for its inspectors. These have been designed by the United States with the hope that they might prove so trouble-free and easy to fly, that everyone will own one. Present cost is $3,190 each; future cost to be less than a thousand berries, if Air Bureau Director Eugene Vidal's dreams come true. The twenty-five will be delivered to Uncle Sam some time this spring.

Physical features of this "latest" are: Four-cylinder in-line vertical engine; internally braced wings, with added external bracing; twin tail assembly, completely fencing in the pusher propeller. Self-starter and storage battery and generator. Top speed, well over 110. Twenty miles per gallon of petrol. Minimum landing speed, 35 m.p.h.; maximum landing speed, fast as the plane goes.

Three wheels form the landing gear, one under the nose and two well back under the wings and separated. The center of gravity, due to the pusher type engine, is back almost over the two rear wheels, making it impossible for the plane to nose over, even when brakes are fully applied. The plane merely stops just as any automobile going the same speed would. Also the wide apart wheels and center of gravity arrangement hold the plane on course when it is running cross-wind on the ground.

The plane is landed or taken off by holding the stick in neutral position and working the throttle. In fact, tests have shown that the plane will take off quicker than when the pilot tries to manipulate the controls to lower or raise the tail, as in ordinary take-offs; that's because the tail can't be lowered or raised when the plane is on the ground, due to the three wheels. This simplified control in take-offs as well as landings makes it far easier for a novice to learn the most difficult feats of flying—getting up in the air okay and getting back down okay.

Minor advantages of the plane are: No slipstream to whip around the passenger's legs when he enters the plane, since the propeller is behind him; wide panorama of vision, not obstructed by any motor; a nose so shaped as to reduce air noises to a minimum; a motor in the rear where its noise is not heard.

GLOSSARY OF WORDS, TERMS AND PHRASES—DIC-A-61

Bubble-Sextant. A navigation instrument, for determining the position of a ship or aircraft, by referring the position of the sun or stars in relation to a bubble in the instrument.

Buckle. A part used for connecting the ends of a strap or belt.

Buckle (Quick-release). A buckle used with a safety belt which can be quickly snapped open when it becomes necessary to leave the aircraft.

Bucking. Irregular jerking and bucking due to the misfiring of an engine. Generally caused by ignition trouble.

Buckled. Bent, curled or wrinkled.

Buckled-column. A column, strut or thin rod bent or deflected laterally by a compressive stress.

Buffed. Polished by the friction of a wheel.

Bug. A key or manually operated switch used in tapping out radio messages. It is operated by a back and forth motion with the contacts regulated by a pendulum weight and a spring.

Bugs. Errors of construction or operation.

Built-up. A part assembled from a number of smaller pieces.

Bull-gear. The larger gear of a pair or series of toothed wheels.

Bump. (1) The sudden rise or fall of an aircraft due to vertical air currents that give the sensation of riding over a bumpy road. (2) To form sheet metal parts by pounding.

Bumped-mounting. A sheet metal engine mounting or bracket formed by pounding out sheet metal.

Buoy. (1) To float or sustain a body within a fluid by the principle of fluid displacement. (2) A floating marker or signal.

Buoyant-force. A lifting force created by the displacement of a mass of fluid by a body immersed in the fluid. When the weight of the displaced fluid is equal to the weight of the object, the latter floats in a condition of equilibrium. The buoyant force is then equal to the weight of the object.

Buoyancy. The property of floating in a fluid.

GLOSSARY OF WORDS, TERMS AND PHRASES—DIC-A-62

Buoyant-Gas. A lighter-than-air gas employed for developing a BUOYANT-FORCE or lifting force in airships and balloons. Hydrogen, helium and coal-gas are examples.

Burble. To create turbulence in a fluid along a surface so that the fluid breaks out of contact with the surface.

Burble-point. The ANGLE OF ATTACK made by an AIRFOIL at which the lift falls off suddenly just after the angle of maximum lift. This is due to the main air-stream breaking away from the upper surface of the airfoil at large angles. Also known as the CRITICAL ANGLE.

Burn. To consume a substance by the action of oxygen, an acid or an alkali. More generally this refers to the action of oxygen in producing COMBUSTION.

Burning (Lead). The process of uniting lead pieces by melting the lead along the joined edges by means of a torch. The parts become virtually one piece.

Burnish. To polish a metal by heavy rubbing with a harder metal. This also creates a denser surface, and closes the pores.

Burns (Acid). Wash the wound thoroughly with water or sop with a mixture of carbonate of soda in water. Dry, apply a BURN OINTMENT AND BANDAGE WITH SOFT MATERIAL.

Burns (Alkali). Flush wound thoroughly with water, flood with white-wine vinegar to neutralize acid, dry wound, apply BURN OINTMENT and bandage with soft material.

Burns (Fire or electric). Cover thoroughly with a BURN OINTMENT applied on sterile gauze or cotton. Do not open blisters. Bandage with several thicknesses of soft material, but not too tightly.

Burn Ointment. This may be a ready-made salve prepared for burns or, in an emergency, can be made by mixing a paste consisting of 3 percent. bicarbonate of soda with vaseline.

Burr. (1) A rough edge or fin left after drilling or machining material. (2) A small washer for placing under the head of a screw or a nut.

Burst. (1) To rupture a material by the application of fluid pressure. (2) A series of shots fired in succession, or from a machine-gun.

BUILD These Beautiful Super-Detail Guaranteed Flying Planes—All in Exact Scale with Cockpit Operated Controls . . . Designed for you by flying men.

Now You Can Build These New IDEAL Full Detail Ship Models.

Hulls are carved from blocks of soft wood; all detail parts clearly printed on wood to be cut out and attached. Masts, spars, rigging, deck fittings, railings, cast anchors, stands and other details are included. Cut out the parts, cement them together, mount the fittings and decorate the model; it's quick and easy. Full size plan to work from and clear instructions come with each kit.

Each kit contains all parts, material fittings plan and instruction for one model.

CONSTITUTION, 18 inches,
$1.50

FLYING CLOUD, 18 inches,
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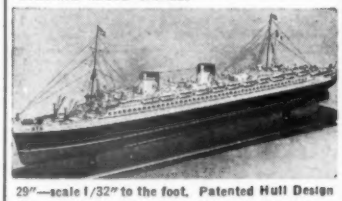
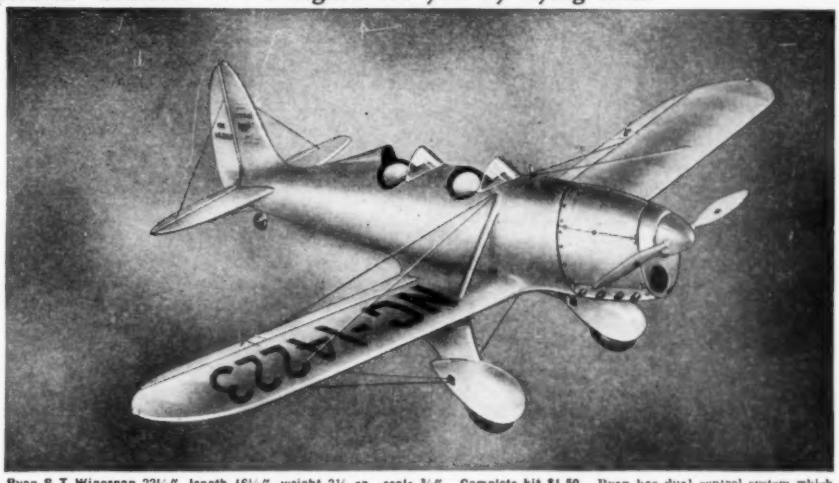
Build the fastest ship afloat, the NEW Super-Detail model—Italian liner REX.



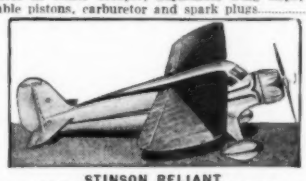
29"—scale 1/32" to the foot. Patented Hull Design

Shaped hull and over 100 metal fittings. 24 cast metal lifeboats; 24 cast stairways, and 2 cast anchors; 4 metal propellers; 6 cast bits; 48 metal davits. The Rex comes in beautiful high luster original colors of black, orange, white, red and green; and the kit also contains turned wood parts, printed wood, cement, wood filler, sandpaper, etc. Full sized plans with complete instructions and 7 photographs illustrating the different stages of construction. All the hard work has been done for you. Kit complete, postpaid..... **$6.00**

Send 5c for illustrated folder of complete list of boat supplies. Interesting and instructive.



Ryan S T Wingspan 22½", length 16½", weight 2½ oz., scale ¾". Complete kit $1.50. Ryan has dual control system which operates in either cockpit; adjustable wing flaps; plans for making an actual working engine—4 cylinders with movable pistons, carburetor and spark plugs..... **$1.50**



STINSON RELIANT
Wingspan 32 5/16", length 21¼", weight 3½ oz., exact ¾" scale.
Adjustable speed arresters built into the wings, movable cabin doors, complete interior with four seats and control column, and all the other Super-Detail features. Colored in bright contrasting yellow and black. Kit complete, postpaid..... **$2.50**

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Wingspan 23⅝", length 16¾", weight 3⅝ oz., exact ¾" scale.
Coated with the new IDEAL high lustre finish, with silver, yellow, red and black coloring. Kit complete, postpaid..... **$2.00**

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Wingspan 35", length 22½", weight 4⅝ oz. Exact scale.
Retractable landing gear, rotating gun turret, movable machine guns, special streamline cowlings, two types of 3 bladed propellers—one for flying and one for exhibition with removable motor sticks for flying; rudder and elevator balanced surfaces; new type freese ailerons. Kit complete, postpaid..... **$3.50**

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Wingspan 21¼", length 18", weight 21½ oz. Exact ¾" scale.
This flying model is an exact replica of the famous fighter—one that is identical in all but size with its noteworthy big brother. Beautifully colored in olive drab and yellow. All Super-Detail parts included. Kit complete, postpaid..... **$1.75**

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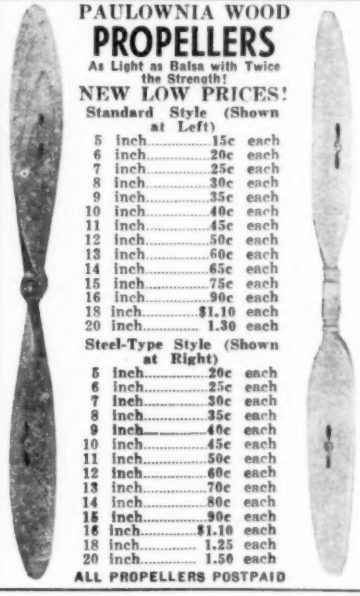

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12	inch	60c each
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THESE new flying "Dwarfs" (½" scale) are identically the same as our famous ¾" models, except smaller. Kits are *every bit* as complete (printed wood, partly finished parts, full size drawings, etc., etc.) except contain NO LIQUIDS. Ask your dealer right away to get the "Dwarfs" you want, if he isn't already stocking 'em. ●

12½" G-B Supersp., 50c

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Add 10c per kit to your order for handling charges (on orders for 6 or more, no handling charge is made). Canada, Mexico, British Isles—add 10% to all prices; other countries, add 20%. ● Send 5c for C-D catalog of 50 models in ¾" scale and C-D Supplies, and catalog of 29 C-D "Dwarfs." ● Dealers! Clubs! Schools! Rapidfire sales ahead—write at once for discounts.

CLEVELAND
MODEL & SUPPLY CO., INC.
1866PAG West 57th St., Cleveland, Ohio, U. S. A.

Airy Chat

(*Continued from page 6*)

valued and shall miss sadly. His intense interest in everything connected with aviation was always an inspiration to others in the field and we extend our sincerest sympathy to his family and fellow officers.

* * *

SEVERAL of our correspondents wish to know why meteorology is frequently referred to in the study of aviation. Further, they don't understand why so much so-called "theoretical" dope is included in ground-school courses. Still further, they hate mathematics and disdain the application of scientific data in flying. All that is needed, according to their idea, is to wind up the engine, climb in and fly. That, to their minds, is "practical."

Well, it's a long story and we, ourselves, have often wondered why all this preliminary scramble was necessary, but it is and always will be as long as the airplane is what it is today. In the first place, such subjects must be studied in order to get a license and that should be a sufficiently practical reason. In the second place, the airplane is not a highly perfected mechanism like the automobile, therefore the pilot or driver of a plane must understand the basic reasons for its many eccentricities.

If it were as stolid and stable as a model T Ford or a Chevvy, and stood with all four feet firmly on the ground, there would be no reason for taking a college course, but unfortunately the airplane is supported by an unstable endlessly varying thin layer of air and not by asphalt.

* * *

THE same thing was true of the automobile in the old days before the public knew what automobiles were all about. There were automobile colleges all over the United States for teaching driving and the maintenance of automobiles, and these schools were well attended, too. But now, there are so many good service stations all over the country that the necessity for understanding automobile construction and repair has vanished. The same will be true with the airplane when its operation has been equally simplified and when you only have to go around the corner to find a competent aeromechanic.

* * *

FOR a long time, I have studied the mechanical development of aviation, have studied early books on the subject as well as the patents issued from time to time. In fact, the study of airplane progress has been a sort of mania with me that has taken more of my time than I could really afford.

And the whole thing rolls itself up into this. There have been no really great aeronautic inventions during the past fifteen years. All of them are simply improvements, or alleged improvements, upon old basic ideas. Apparently, there has not been one revolutionary thought on the subject that has been worth while since the War.

There have been numberless little gadgets invented, true enough, but if we trace back closely we will be likely to find that most of these are simply re-inventions. About two years ago, there was a big whoop and hullaballoo about the wonders of wing flaps but these were tried out and discarded as far back as 1910. There used to be planes that were actually automatically and inherently stable, but the reverse is true now. Maybe, after we have a coupla hundred more accidents with the present type landing gears, which are wholly inadequate, we'll get back to the old time skids which were a real protection.

* * *

DID you see the latest thing in streamlining? Well, I'll tell you all about it. It's a streamline refrigerator, heaven help us, and that is the ultimate in nothing to streamline according to my ideas. If this thing continues, I'm going to streamline my lawnmower this summer, just to stay in fashion.

* * *

I HAVE a question to ask and then I'll hand you the answer right after it. QUESTION: When a body is perfectly streamlined is all of the air resistance reduced to nothing so that the body can be moved through the air without effort? ANSWER: No. Streamlining simply eliminates the resistance due to turbulence and disturbances but it does not reduce the skin-friction or rubbing friction of the air along the surfaces of the body. When streamlining is carried out to the ultimate limit, there still remains the skin-friction due to the rubbing of the air-stream.

* * *

WELL, it's getting near closing time and I expect to hear the whistle almost any minute. Good luck and cheerio.

J. B. R.

Morane-Saulnier

(*Continued from page 25*)

The aileron, compensated, is tailed into the trailing edge, almost on the whole of the cantilever. The tail planes are of metallic structure, made of spars of duralumin round tubes and of ribs of pressed duralumin sheets, the lining of the whole being made of fabric; the wiring system is made of streamline thin metal sheets of great resistance.

The monoplane is equipped with a Hispano Suiza motor, of 500 h.p., type 12 Xbrs, with supercharger and gear reducer. The nominal rated full-load speed of the engine is 2,600 revolutions, while that of the propeller is 1,770 revolutions. This is a motor of 12 V-shaped cylinders, with 130 mm bore and 170 mm stroke.

END.

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"Your method of accurately forming the major parts of a model mechanically seems to simplify the art to such a degree that anyone can now be a successful model builder."
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RYAN Sportster

THE NEW RYAN SPORTSTER. An exceptionally realistic miniature, embodying every modern principle of light commercial planes to assure long distance flying.

The SELLEY-TEX moulded parts included in this kit are as follows: Fuselage, balancing ring, nose piece, spinner, head rest, rudder fairing and combination pants and landing gear; these together with special parts and materials as listed complete this outstanding value.

Exclusive Features Found Only in Selley-Tex Kits

Moulded Fuselage	Moulded Pants
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All moulded parts are beautifully finished in the authentic color combination of each individual model.

LISTED PARTS AND ACCESSORIES

Finished scale flying, adjustable pitch metal prop, finished propeller shaft and rear hook, scaled wheels, with brass bushings, ribs printed out accurately on white sheet balsa, many special turned wood parts, finest grade of balsa wood, sticks, tail wheel and fork fittings, control horns and wire, pure para rubber, special bamboo paper, authentic markings, colored insignia, best quality cement, colored dopes, full size easy-to-understand plan, all tools necessary to build, CLAMPS, RAZOR BLADE, BRUSH and SANDPAPER.

ALL 24-INCH WING SPAN

AERO DIGEST. *"Let me add my congratulations to those you certainly must be receiving from everyone who appreciates the problems of model builders."*
Signed—George F. McLaughlin, Editor

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GOSHAWK

GOSHAWK. A powerfully attractive flying scale replica of the speedy Navy fighter and accurate to the minutest detail.

The following SELLEY-TEX moulded parts: Fully detailed fuselage, bulkhead, head rest, balancing ring, drag ring, bombs, belly tank, wheel shoes, shoe fairing, tail wheel fairing and a special fully scaled 9-cylinder motor, detailed with push rods, all the fine scale parts and materials as listed complete this very extraordinary value!

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"The familiarity of the American youth with this moulded process will pave the way for its early application to full size aircraft."
Signed—Vincent Burnelli.

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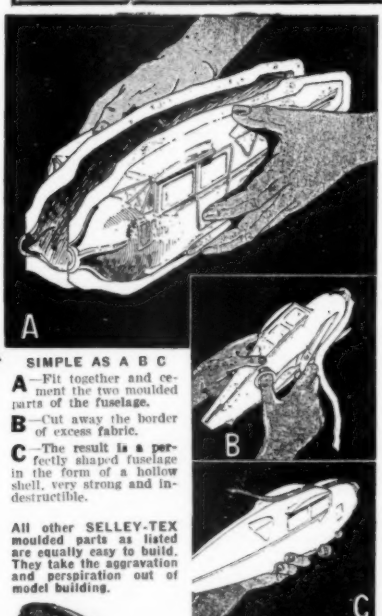
BOEING F4B4
A dynamic reproduction of the popular Navy pursuit plane, developed for stamina and designed for speed.

The SELLEY-TEX moulded parts include fuselage sides, bulkhead, balancing ring, head rest, wheel fairing and tailwheel fairing, special scaled 9-cylinder radial motor detailed with push rods and a drag ring. Also the many special parts and materials as listed come in every SELLEY-TEX kit. WHAT a VALUE!



SIMPLE AS A B C

A—Fit together and cement the two moulded parts of the fuselage.

B—Cut away the border of excess fabric.

C—The result is a perfectly shaped fuselage in the form of a hollow shell, very strong and indestructible.

All other SELLEY-TEX moulded parts as listed are equally easy to build. They take the aggravation and perspiration out of model building.

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Signed—John Carisi

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WACO C CABIN. A masterpiece of authentic model design, incorporating every scientific feature to insure maximum flying performance.

Fully detailed SELLEY-TEX moulded fuselage, bulkhead, balancing ring, cowl, cowl bumps, pants, pants fairing and a special full-scale 9-cylinder motor, with metal push rods and a special moulded celluloid cabin windshield; the many special scale parts and materials as listed complete this amazing value.

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"With your new process I would judge almost anyone should be able to make a successful model."
Signed—Casey Jones.

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WACO D MILITARY

WACO D MILITARY. A wealth of military detail characterizes this formidable prototype of the latest Army innovation, and what a flyer!

The SELLEY-TEX moulded parts comprise the following: Fully detailed fuselage, balancing ring, bulkhead, cowl, cowl bumps, wing mount guns, bombs, pants, pants fairing and a special fully scaled 9-cylinder radial motor with metal push rods. A special moulded celluloid enclosed cabin windshield is also included to give that added bit of realism, as well as all the special parts and materials as listed completes this unusual value!

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FAIRCHILD 22. A magnificent example of practical model construction, embracing durability of structure and ease of performance.

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The SELLEY-TEX moulded parts include fuselage, bulkhead, balancing ring, cowl, pants and pants fairing, special 7-cylinder radial motor to scale with push rods, and exhaust fairing, also all materials and special parts as listed complete this remarkable value.

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AIRPLANES WANTED

Advertise your wants in this column. The service is free and you are sure to contact the plane that you want at the price you are willing to pay.

STANDARD LIGHTPLANES

HEATH LIGHTPLANE WANTED, either model LN or V. Must be in good condition and cheap. —J. P. HYDE, Rapidan, Va.

CORBEN BABY ACE wanted, an Aeronca or Heath V. Must be in good condition and reasonably priced. Send photo and complete description in letter. Preferably, this ship should be located near Georgia.—HOLLIS S. ANDERS, U.S.S. MacDonaugh, c/o Postmaster, New York, N. Y.

LIGHTPLANE WANTED, preferably an Aeronca, must be licensed. To be used for building up time. It must be cheap and sold on the payment plan, a certain amount down and the balance monthly or weekly.—RICHARD DECKER, Wauseon, Ohio.

AERONCA, Taylor Cub or similar lightplane wanted. Will pay $100 and trade Nerdihoff Generator and magneto test bench, Atlas lathe, G.E. 12 Battery charger and other equipment.—GEORGE SOLOTAR, Salisbury, Md.

BUHL BULL-PUP or a Curtiss Jr. wanted. Must be licensed and priced about $300. However, I will pay more if the ship is worth it.—JOE HETTEL, 304 N. 41st St., Camden, N. J.

AERONCA WANTED, late model, licensed, 2-place for cash. Also want licensed Taylor Cub, Fairchild 22, D. H. Gypsy Moth or Porterfield Flyabout. Also, a Kinner-Bird, late type. I will pay cash for crack-ups, engines and parts. Give all facts in your first letter.—D. C. STOW, JR., 73 E. Washington St., Gainsville, Ga.

WANTED. HEATH 1929 Super-Parasol or Heath Model V Parasol with welded or bolted fuselage and powered with a Henderson converted motor. Prefer uncovered or partially covered plane, complete and in good condition. Motor may need overhaul. Will also consider cracked or incomplete ship, wings, fuselage, tail, any parts. Henderson converted motor, 18x3, 14x3, 16x4, 20x4 wheels, tires and tubes: 7:00x5 and 5:00x4 airwheel hubs, tires and tubes, dope instruments, throttles, spark and choke controls, steel tubing, etc. Write, giving full description to FRANK O. EARLES, Hayes, S. Dak.

LICENSED AERONCA WANTED, State full particulars in first letter. Will trade 1934 Harley-Davidson motorcycle.—GLENN LORENSEN, Canton, S. Dak.

WANTED: Heath, Standard, American Eagle or other plane, with or without motor. I have a 29 Harley-Davidson motorcycle in extra good condition, also a $100 electrical engineering course.—VELMO SULLIVAN, 201A Madison, Aurora, Mo.

LICENSED LIGHTPLANE WANTED, in good condition, NB 8, Taylor Cub, American Eaglet or similar ship, priced at $400 or under. The price must include delivery to Washington, D. C. Will also consider a Monocoupe or some other ship in that class. State condition of ship and price in your first letter.—GEO. A. SPAARGAREN, Private U.S.M.C., Brown Field, Quantico, Va.

PIETENPOL AIR-CAMPER WANTED. Slight crackup considered if serviceable and if motor is in good condition. Cash, trade or cash with trade.—T. L. DAVIS, Reedo Spring, Mo.

CURTISS-WRIGHT JUNIOR preferred, a Pitenpol or other light two-place lightplane. Must be reasonably priced for cash.—JOSEPH A. BALCH, Post Road, Warehouse Point, Conn.

LIGHTPLANES—UNCLASSIFIED

WANTED—Lightplanes and gliders. The condition is no object if they are repairable, and if price is low.—LAVENE FLYING CLUB, Philadelphia Muncipal Airport, Philadelphia, Pa.

LIGHTPLANE WANTED. Will pay $450 cash for a light two-place plane.—E. N. MILLER, 459 Massachusetts Ave., N. W., Washington, D. C.

WANTED. Lightplane in any condition. Make us an offer.—MELVIN CHRISTLER, Cody, Wyo.

LIGHTPLANE WANTED. I am in the market for a lightplane, with or without engine. I have a Pietenpol Air-Camper, incomplete, which I will trade in or I will buy the ship for cash.—HAROLD MATHERS, Park Hotel, Warren, Ohio.

LIGHTPLANE WANTED, biplane type, a Pietenpol or any other high performing plane. Will consider crackups or unfinished planes. Please give details and photo if possible in first letter. Must be reasonable for cash.—RONALD HOOG, Wellington, Colo., Box 62.

WANTED. Any 2-place lightplane. Prefer Pietenpol, Barling NB-3, Corben, Great Lakes Trainer or Monocoupe in any condition. State price in first letter.—JOHNNY HOFFMAN, Route No. 4, McCook, Nebr.

LIGHTPLANE WANTED, finished or unfinished, cracked or in good condition. Wha 'Cha got?—T. HILLHOUSE, Box 145, Lawrenceburg, Tenn.

WANTED: 2-Place lightplane, no particular make, in fair condition. Price not to exceed $250 on terms. Preferably, this plane should be located within 500 miles of Corpus Christi.—CLIFTON SPEER, 563 Mecca Hotel, Corpus Christi, Texas.

WANTED. A 2-place lightplane, a licensed plane preferred. Will pay up to $300 for a good buy.—R. COBURN, 124 Norfolk St., Springfield, Mass.

WANTED. 2-place lightplane like "98 Trainer," Ford power-plant.—G. W. LARSON, Fosston, Minn.

WANTED. A lightplane, one or 2-place, reasonable price, licensed or eligible for a license. Must be a good buy. Preferably located in New York State or vicinity. Send complete description.—RAY WATROBSKI, 228 3rd St., Scotia, N. Y.

WANTED. Good used lightship. Must be located in Oregon or California. One or 2-place job, with or without motor. Will answer all letters.—ROBERT F. BAKER, P. O. Box 405, Napa, Calif.

WANTED. Lincoln sportplane, 1-place, without motor or covering. No crackups considered. Will go anywhere within 500 miles to see one.—W. T. HOWELL, 9202 Hayes Blvd., Detroit, Mich.

SPORTPLANES—50 H.P. AND ABOVE

TRAVEL-AIR WANTED. Series J5-4000 or J6-7 in need of overhaul or cracked up. With or without engine.—DONALD ROCKWOOD, 50 Chalmers St., Williamsville, N. Y.

WANTED. Used two or 3-place plane, one needing recovering or minor repairs, considered. Must be priced low. Will give car and cash or all cash if a bargain.—P. H. RAY, Overton, Texas.

WANTED. Low priced seaplane, licensed, or a pair of licensed pontoons that could be fitted to a landplane.—FRED L. WEBBER, RFD-2, Newport, R. I.

WANTED. Two or 3-place licensed plane in good condition. Cruising speed 100 m.p.h. To be delivered to my home airport subject to thorough inspection. Will pay up to $200 cash. —S. W. MARTIN, Montmorenci, Ind.

WANTED. Any kind of 0X5 job or lighter ship. Must be in good shape, licensed and cheap.—J. N. SIMMONS, Box 215, Van, Texas.

WANTED. Eaglerock center-section model, with or without 0X5 engine.—E. B. HENNINGER, Kilgore, Idaho.

WANTED. Two or 3-place plane. Must be reasonably priced and licensed.—RALPH HAEFS, Bonduil, Wis.

WANTED. Small two or 3-place plane. Must be cheap.—P. LECKENBY, Split Rock, Wyo.

WANTED. A good used 0X5 powered ship. Must be licensed, or eligible for a license. Will pay cash if cheap and satisfactory, but no junk wanted.—S. HANGO, Mahnomen, Minn.

WANTED. A plane under the $500 class such as a Waco, Travel Air, Bird or small radial job under 125 h.p. Will consider minor crack-up or ship needing recovering if priced right—DALE BRETZ, 1295 Inglis Ave., Columbus, Ohio.

(*Concluded on page* 52)

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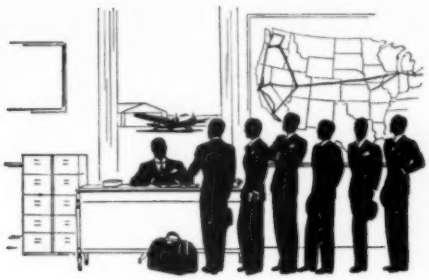

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Planes Wanted

(*Continued from page 50*)

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WANTED. Licensable Great Lakes or any similar ship using American Cirrus engine. I do not wish an engined plane.—R. A. RUBACK, 36 McClellan Ave., Amsterdam, N. Y.

WANTED. A two or 3-place ship, licensed, costing less than $500. To be located within a radius of 500 miles of Minneapolis, Minn. Give all details in first letter.—E. D. SWANSON, 2624 Blaisdell Ave., Minneapolis, Minn.

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1".....4c 1½".....5c
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WANTED. A 2-place cabin job, 100 h.p. engine, or over. Must be cheap.—JAMES FOYSTER, 243 Roehrer Ave., Buffalo, N. Y.

WANTED. 3-piece 0X5 plane. Must be eligible for license. Will take plane requiring some repairs on plane and engine. Price not to exceed $200.—STANLEY KRUPINSKI, P. O. Box 392, Webster, Mass.

WANTED. Doyle 2-place monoplane in flying condition or repairable.—ORVILLE WOGEN, Emmons, Minn.

WANTED. A 1930, or later, Velie Monocoupe. Send complete details, lowest cash price wanted and picture. I have a very good 26-foot deep-sea cabin cruiser to trade, snappy looking, fully equipped, New England built, copper fastened.—L. C. ARCHER, 34 Romeyn Ave., Amsterdam, N. Y.

WANTED. The best airplane that $500.00 cash will buy. Must be licensed or eligible for a license. Give all important information in first letter.—R. J. JOHNSON, 1844 Woodmere Ave., Detroit, Mich.

WANTED. A 2-place plane, economical to operate and not too large. Possibly, with dual controls, and eligible for a license. Send complete description with snap-shots, if possible.—LAWRENCE ALDERMAN, 704 Court St., Beatrice, Nebr.

WANTED. I need one plane near Des Moines, Iowa, and one near St. Paul, Minn., and I will need several more later on. The planes that I want are any kind of an 0X5 job or any other similar job that I can buy very cheap. I will pay up to $300.00 for these planes.—F. F. FRAKES, Hermitage Hote., Nashville, Tenn.

WANTED. Any two or 3-place job and $125 for a 1½ ton Ford coal truck, one that can be used as a tractor with a semi-trailer. A 1931, 4-speed new motor, equipped with sem.-Diesel piston rings, dual wheels, good tires, completely rebushed and overhauled. Worth $300. A complete new clutch assembly.—JOHN A. DUNKLE, RD-4, Box 703, South Akron, Ohio.

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WANTED, Cracked up lightplane that can be repaired, less engine. I have radios and radio parts or what do you want?—PERSHING GETZ, Freeland, Md.

WANTED. I can use a set of wings, a center section, flying wires, landing-gear and propeller for a T-P Swallow. Prices reasonable.—E. PARK, Beloit, Kans.

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WANTED. A primary glider. Must be cheap.—John Urban, Western Drive, Longmeadow, Mass.

WANTED. Primary or utility glider. Must be in good condition. Have Baby Pearl miniature camera, also 35 mm. combination movie and still camera, or cash. Please send photo if possible.—FRANKLIN GLIDER CLUB, 1423 Buffalo St., Franklin, Pa.

WANTED. A good glider. Must be cheap for cash.—JOSEPH A. BALCH, Post Road, Warehouse Point, Conn.

WANTED. A glider new, used or not too badly damaged, conventional primary training glider. The price must be right.—G. M. BUTCHER, 348 Oakland Beach Ave., Rye, N. Y.

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PATENT YOUR IDEA

Here and There

(*Continued from page 36*)

tion; a steady stream of private, commercial and military planes arriving and departing almost continuously.

* * *

Credit for the smooth operation of this large aviation center is without a doubt due to the very capable men in charge. One of the youngest and most active airport managers is John Allen Casey, 35 year old flying-manager.

He learned the art of kicking a rudder out at the old Government field located at Maywood, Illinois.

A nice big hand is also due to John N. Becker, Edward Kampwirth, Jimmy McGoune and Bill Selleck for their handling of the city's radio transmitter. Any hour of the day or night you can find one of these boys in the little penthouse atop the adminstration building.

* * *

On a recent visit to all airports around Chicago, I discovered many of them would make better seaplane bases than landing fields. Managers informed me that they had never seen their fields in such a condition for many, many years. If we get the usual heavy rains in June, there will be a lot of small lakes with a wind-sock bobbing around just above the waves.

* * *

Remember the old saying, "When a man bites a dog, that's news?" Well, when an air school sues a student for wrecking their planes; that isn't news, but here is some news. Nineteen-year-old Freeman Brown of Chicago is seeking $30,000 damages from John H. Armstrong and other officials of the A. T. C. Aeronautical school. According to the bill filed in the circuit court, the youth cracked up the plane and suffered serious leg injuries. He charges he was commanded to fly solo before he knew how to fly well enough. I wonder if his instructor had to use a gun to do the forcing with.

* * *

There is a lot of talk going around these parts concerning the location of this year's National Air Races; they want it in Chicago, but I'll lay 5 to 1 it gets run off in the State of California.

* * *

Hundreds of sea-gulls may be seen any day flying around the Municipal Airport. I have wondered for a long time if these birds were not attracted to the field by their mechanical imitations. Mr. John Becker claims they come out there from the lake to practice landings. END.

Erratum

BECAUSE of an error, the article, "*Nungesser's Hanriot*" in U. S. A." appearing in the April issue, was credited to the wrong author. The real author is H. S. Zadach—not Fred L. Westlake, as appeared in the issue.

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Engines
(*Continued from page 40*)

as in the Liberty engine, has 3 dangerous resonant periods, all having the same fequency. In the case of the Liberty these were 1000 r.p.m., 1330 r.p m. and 1710 r.p.m. At 1000 r.p.m., there are six vibrations; at 1330, 4½ vibrations, and at 1710, 3½ vibrations per revolution. The frequency in all these periods is 100 vibrations per second.

In the case of a direct-drive 9-cylinder radial engine, such as the Wasp, it was learned that a dangerous resonant range exists approximately from 2200 to 2800 r.p.m. The frequency is 165 vibrations per second at 2200, and 210 vibrations per second at 2800 r.p.m.

It is probable that the truly resonant period is about 2500 r.p.m., at which speed the frequency is 187.5 vibrations per second. In the Liberty engine, crankshaft failures occurred when operating near the 1330 and 1710 r.p.m. periods, while several failures have occurred in Wasp engines with flying propellers, at 200 r.p.m.

It has been determined that the propeller used has a vital effect on the resonant range, some propellers on the Wasp engines reducing the lower range from 2200 to about 2000 r.p.m. It is also found that all engines employing reduction gearing have lower resonant frequencies than do direct drive engines of the same type.

In some of the geared engines this reduction of frequency was great enough to remove the resonant range entirely out of the cruising and full throttle range utilized in the air. In others, the resonant period was unfortunately placed where it was necessary to cruise for extended periods with the crankshaft in torsional vibration.

As a result of this, cone galling and cracking of propeller blade shanks were encountered, with some actual failures chargeable to this cause.

The latest development is a remote control torsiometer, which could be operated by a pilot while flying. With this device it is believed the first actual flight records on an airplane engine have been obtained by the Air Corps. This instrument is being refined and will prove a very useful device, being much more convenient as well as faster and safer than the use of the original instrument.

This study has already resulted in making engines much safer in flight, and as a result of the knowledge obtained a very successful damping device has been developed by one manufacturer which prevents torsional vibration at any engine speed. In other cases, suitable changes in rigidity of crankshafts have removed dangerous periods to little used speed ranges and thus minimized danger of failure.

If the natural period is out of the running range, the propeller is saved many stresses and danger of crystallization.

Speed limitations have been placed on still other types in which no other remedy has yet been found. The constant aim has been to make Air Corps engines secure against mechanical failure due to crankshaft resonance in order that the pilot's confidence in his engine may be justified.

END.

Warplanes
(*Continued from page 27*)

mean ability. A variety of different types were produced, but the best known is the small single-seat scout or "destroyer" type, and "Old Daddy Two-Tails" shown here.

The large twin-fuselage Ago plane, original purpose unknown, was the first of the double fuselage type. Two complete streamline fuselage were carried out with independent rudders and vertical fins, but with a single fixed stabilizer end elevator connected between the ends of the two fuselage. Between the fuselage was a short nacelle which carried the power plant, pilot, etc.

Strangely enough, this was a single-engine pusher type with the 150 h.p. Benze engine located at the rear of the central nacelle. The type number of the plane illustrated is C-1 and it was produced during 1915. This was discontinued in the pusher form and was later, to a limited extent, replaced by twin tractor engines in each of the fuselage. The speed scouts were powered by air-cooled rotary cylinder Oberursel engines which were more or less copies of the Gnome.

The Ago company profited greatly by the fine work of the Swiss designer Haefeli who was formerly an engineer with the Farman Brothers of France. The structural work on the Agos was rugged and very interesting from an engineer's standpoint.

Not much is known about the Euler planes produced during the war, although August Euler was one of the first certified pilots in Europe. Euler, before the war, obtained a license for building Voisin planes, and finally the wartime name of the company became: August Euler Niederrad bei Frankfurt, a. M. Euler was a staunch advocate of the air-cooled rotary engine of the Gnome type. In fact, it is said, Euler continued to employ Gnome engines long after the war started—probably from his large stock on hand.

The two-seat Euler shown is Type B-1, produced in 1914 and powered with a 100-120 h.p. Mercedes.

It is quite interesting to note the great amount of development and experimental work carried on by the Central Powers during the war. This was due to the fact that these countries did not have much confidence in heavier-than-air craft prior to the war but put all of their confidence into the dirigible. With the exception of a few Taube types, none of our enemies did nothing much to develop the airplane until the real necessity arose.

However, what they lacked in airplane design they made up in the way of engines. The great majority were water-cooled types such as the Mercedes, Benz, etc., engines of fine performance and endurance.

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NEW CURTISS F11C4 NAVY PURSUIT

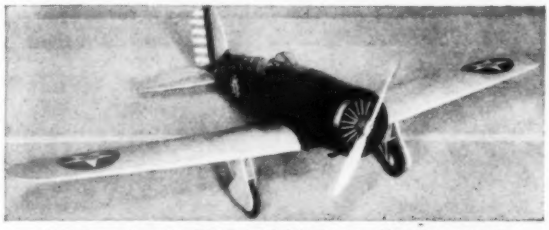
28″ Span, Length 20½″, Weight 4 oz., 1″ Scale

THE MOST EXCLUSIVE AND FINEST EQUIPPED MODEL IN THE WORLD

A special De Luxe model, one of the most beautiful and finely detailed ever made, with its special exact scale 3¾″ celluloid, 700 H.P. type, Wright Cyclone motor, having aluminum push rods, cylinder fins, etc., like real motor. Also in set are 4″ aluminum cowl ring, 9″ carved spruce semi-scale flying propeller, colored star and rudder insignia, 2″ celluloid balloon wheels, silver dope, paint, black, red striping, Navy lettering, wire parts formed, axles, rubber motor, windshield, instrument board, flying wires, 4 aluminum step plates, aluminum wing walks, ready cut wheel pants, etc. All other parts printed on balsa. Detail scale drawing.

Construction Set Complete, postpaid **$4.50**

NEW LOCKHEED P23 ARMY PURSUIT



32″ Span, Length 22½″, Weight 3¼ oz., ¾″ Scale Model

One of the most outstanding values in models; it has excellent lifting power, rising from land or water in a few feet. From the latest Army land plane it is convertible into Lindbergh's seaplane by attaching the floats. Construction set contains: formers, ribs. All other parts printed on balsa, 3⅜″ turned cowl front, celluloid wheels, axles, colored insignias, U. S. Army lettering, semi-scale propeller, yellow and drab dope, glue, 33″x44″ full scale drawing, etc.

Construction Set Complete, postpaid, Landplane **$2.50**

Seaplane Set. Same as above with printed float parts, stringers, dope, etc. Drawing shows float attachment and design.

Combination Land and Seaplane Set, postpaid **$2.95**

NEW CURTISS SEA HAWK P3A

22½″ Span, Weight 2½ oz., ¾″ Scale Model

An excellent flyer. Will make a fine showing in any contest. Set contains 3″ celluloid motor and cowl, celluloid wheels, colored dope, all parts printed on balsa.

Construction Set Complete, postpaid **$2.75**

BOEING F4B4 NAVY PURSUIT

1/5 H.P. Gasoline Motor Driven Model

68″ Span, Length 44″, Color Silver

This is not just an ordinary large model, but one specially designed and engineered to stand the strain of the gas motor.

An exact scale model 1/5 the size of the real large plane rated as the finest biplane fighter in the U. S. Navy. This is the most realistic and life-like model of this size ever produced. As all the fuselage formers, wing ribs, tips, etc., are all cut out and notched for stringers, spars, etc., even a novice can make a perfect model of it with ease. Set contains 6″ turned balsa wheels with bearings, rubber tail wheel, a special 10″ turned balsa tapered cowl and motor unit, silk covering material, silver and red dope, glue, full size scale drawing, axles; all wood cut to size, etc. Weight of model with motor 3½ lbs.

Construction Set Complete, without motor, postpaid **$25.00**

NEW CURTISS ARMY HAWK P6E

24″ Span, Weight 2¾ oz., Color, Drab and Yellow

A new, improved model. Very strong and an excellent flyer. Set includes all parts printed on balsa, hollow metal exhaust pipes, aluminum wheels, 2 oz. yellow dope, 1 oz. drab, 1 oz. paper cement, 2 oz. glue, Army lettering, numerals, bearing button instrument board, tail wheel, colored insignia and all parts to make model as shown. **Set postpaid** **$2.50**

CURTISS SUPER HAWK F6C3

20″ Span, Length 13¼″, Color, All Silver

A very easy to build set, all parts printed on balsa, turned wood wheels, lettering insignias, colored dope, drawing, etc. **Set, postpaid** **$1.50**

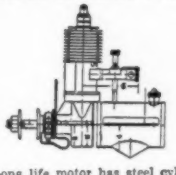
NEW BOEING F4B4 NAVY FIGHTER

22½″ Span, Length 14½″, Weight 2½ oz., Color, Silver and Yellow

New improved model exclusively equipped with new 3¼″ special aluminum streamline tapered cowl ring, 9 cylinder celluloid motor with aluminum ventilator front, 8″ carved varnished propeller, printed out balsa wood parts, silver dope, paper cement, glue, formed wire parts, celluloid wheels, tail wheel, U. S. Navy lettering, colored insignia and ¾″ scale drawing. **Construction Set Complete, postpaid** **$2.95**

1/5 H.P. Gasoline Model Motor

Weight As Shown 8 oz.



Long life motor has steel cylinder and piston, ⅞″ bore x 1″ stroke. Comes complete with gas tank, coil, condenser, batteries. Price ready to run, complete, postpaid, only **$22.50**

15″ or 19″ laminated prop. for motor $2.75

Northrop FTI Navy Fighter

22″ Span, Weight 2 oz., Color Silver, ¾″ Scale

Exact scale model of the Navy's latest 272 m.p.h. fighter. Set includes all parts printed on balsa, 3″ turned cowl front, colored insignia, lettering, colored dope, drawing, etc.

Construction Set, postpaid **$2.00**

NEW 1935 CATALOGUE JUST OUT

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MINIATURE AIRCRAFT CORP., 83 Low Terrace, New Brighton, N. Y.

Switzerland

(*Continued from page 24*)

Berne, Geneva, Zurich and St. Gall-Altenrhein, taxi and tourist flights may also be made at any time in heated cabin airplanes to any place in Europe.

The well-known "Swissair" company, with offices at Zurich, Basle and Geneva uses three-motored Fokker planes for alpine flights, which, according to experts, are best made in the morning. Then the air is calmest and the contrast between the deep valleys, the sombre crags and ermine-clad peaks shows most forcibly.

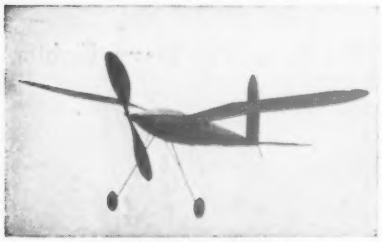
The warm, comfortable planes are equipped with spacious windows, affording an unobstructed outlook, so that photographs can easily be taken from the passengers' seats.

Alpine flights are only made in clear and favorable weather, the Air Transport companies always keeping in touch with the Swiss Meteorological Head Office. Since ascents and descents are effected gradually there is, on medical authority, no danger of impairing a passenger's health. The maximum altitude reached on a one-hour-flight is 2,000 meters, on a two-hour-flight about 4,200 meters, and on a three-hour-flight 4,500 meters.

During the past sixteen years, thousands and thousands of air passengers have been taken over the Alps without a single fatal accident. Besides, every passenger holding a valid ticket is adequately insured with a Swiss Insurance company against injury, disablement or death.

A few months ago, a report made the rounds of the American press pointing out how, in 12 years of operation, not one fatal accident occurred on Swiss airlines engaged in the transportation of passengers, mail or freight. This high standard of aviation in Switzerland is attributed to a large extent to the ability of the pilots, who are men of long experience and rigorous military training.

SPECTACULAR



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Complete Kit Postpaid $2.25 Catalogue 3c Stamp

BUNCH MODEL AIRPLANE CO.
2303 S. Hoover St. Los Angeles, Calif.
A company owned and operated by Licensed Transport Pilots and aeronautical Engineers.

Model Dept.

(*Continued from page 41*)

little patience is required here to carve and sand landing to proper shape.

OIL COOLER AND RADIATOR

Build these up as shown on plan. There are two oil coolers on front bottom side of fuselage.

WING STRUTS

After wing struts have been built, carve and sand either end of strut so they will fit perfectly over rib D and against cowl.

COVERING THE MODEL

Apply tissue to the various framework members, using a light grade of model airplane dope to fasten it to the outer edges. Stretch tissue as tightly as possible to remove all wrinkles. When edges have dried, apply coat of water to tissue. When all water has dried completely, tissue will become taut. May we suggest that you pin wings, elevator and such up a flat surface to keep from warping.

ASSEMBLY

One-eighth-inch by ¼-inch wing braces are cemented to lower longerons to receive wing panels. Insert pins in braces to hold wings in position. The stiff paper wing fillets can now be cemented in position. Cut tissue along top longerons at rear of fuselage and fold flap up so elevator can be cemented in position. The tissue flap is now doped to top side of elevator.

Cut tissue away from either side of rear section of fuselage to permit the installation of new rubber motors; also the winding of rubber motor from rear with a mechanical winder. Landing gears and other small details can now be assembled to the model. Always remember, the details add to the appearance of the model.

TESTING AND FLYING

With the rubber motor and flying propeller in place, gently launch your model over tall grass, to see whether it is properly balanced. If model glides a short distance, and nose rises abruptly, it will be necessary to add weight to bottom of nose block. After the model is balanced to glide at an even angle, you are ready to test your model under power.

In making the test flight, the principal thing to avoid is damage to your model. Gliding and flying it over tall weeds is the safest because the weeds or tall grass break the fall gently in case that the model should stall or dive. Next, look out for any solid obstructions like trees, stumps, posts or buildings, because it appears to be the tendency of every new model to attempt suicide. Be careful at the beginning for a moment's carelessness may undo days of work.

A few trial flights will acquaint you with the ship, and all other adjustments can be made through the adjustable control surfaces.

END.

F. A. I.

(*Continued from page 24*)

RECORDS OF LIGHT-AIRPLANES (CLASS C)
(First category. Multi-seaters with empty wt. less than 560 KGS. (1,234.576 pounds)

Airline Distance (International), first category .....1,809.429 miles
Lalouette and de Permangle, Istres, France, Jan. 11, 12, 1931.
National (U.S.) Record.....None

• • •

Altitude (International), first category .....30,453 feet
Comm. Renato Donati, pilot, M. Lanciani, passenger, Italy, Dec. 30, 1932.
National (U.S.) Record.....18,543 feet
Willfred G. Moore, Kansas City, Mo., Sept. 30, 1929.

• • •

Speed for 100 KM. (International), first category .....181.539 m.p.h.
Maurice Arnoux, France, Aug. 25, 1934.
National (U.S.) Record.....172.225 m.p.h.
John H. Wright, pilot; Karl E. Voelter, passenger, Miami, Fla., Jan. 15, 1925.

• • •

Speed for 1,000 KM. (International), first category .....173.373 m.p.h.
Capt. Puget and Lt. Moulignat, France, Aug. 18, 1934.
National (U.S.) Record.....None

• • •

LIGHT-AIRPLANES (CLASS C)
(Second Category. Single-seaters, wt. empty less than 450 KGS. or 992.070 pounds.)

Airline Distance (International), second category .....2,225.747 miles
Capt. Skerzinski, Poland, from St. Louis, Senegal, to Macelo, Brazil, May 7, 1933.
National (U.S.) Record.....1,650.00 miles
D. S. Zimmerly, Brownsville, Tex., to Winnipeg, Alta., July 17, 1929.

• • •

Altitude (International), second category .....32,834.546 feet
Furio Niclot, Italy, Dec. 24, 1933.
National (U.S.) Record.....24,074.730 feet
D. S. Zimmerly, St. Louis, Mo., Feb. 16, 1930.

• • •

WORLD'S RECORD

Speed for 100 KM. (International), second category .....222.863 m.p.h.
Arthur C. Chester, Miami, Fla., Jan. 9, 1935.

• • •

Speed for 1,000 KM. (International), second category .....206.843 m.p.h.
R. Delmotte, France, Dec. 26, 1933.
National (U.S.) Record.....None

• • •

This completes the first half of the international and national airplane records as determined by the National Aeronautic Association and the Federation Aeronautique Internationale. There are so many records established under such a variety of classifications and sub-classifications that it is impossible to include them in one issue. The remaining records, will appear in the next issue. END.

Learn to Fly

(*Continued from page 34*)

Did she start? At the first snap. Did she idle nicely? Like hell she did—the dumb Stude had knocked the throttle *full on*, and away she roared—jumping the wheel chocks and starting for the neighboring state. There she roared, straight for the nearby forest — and was just about up to flying speed when "plop—poop—bang" she back fired and died cold, coming to a stop with no one the worse, except those of us with weakened hearts.

If the Student had been careless, so had the owner, for of all times to do so, he had this time fortunately forgotten *to turn on the gas*. Advice—Never trust nobody.

END.

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Model Airplane News is the magazine of the hour in the Model Airplane Field. It has attained that position because of its timeliness, authenticity and consistent importance with its news with reference to Model building and its direct relation to aviation and flying itself. Month after month, Model Airplane News is right on the spot with everything that's new and worthwhile in the industry. Model Airplane News is the accepted publication of record in model airplanes and if you build and fly them—or even if you actually fly yourself—then you have got to get Model Airplane News regularly—and Now you can obtain it on the most economical basis ever known.

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Two-Row Engines

(*Continued from page* 12)

as the single-row engines of the Pratt & Whitney Aircraft Company.

The front cylinders of the two-row engines, together with their valve gear resemble very closely the cylinders of the single-row engines, while for the rear cylinders the cams and valve gear are behind instead of in front, with corresponding modifications in the cylinder heads. The larger of the two engines is generally rated at 800 horsepower at 7,000 feet, and the other at 700 horsepower at 8,500 feet.

In view of the need for relatively low propeller speeds for best efficiency at high powers, the Twin Wasp engine is made only with geared propeller drive and that drive is preferred for the Twin Wasp Junior.

In one typical case, a direct comparison between corresponding two-row and single-row engines is possible, for in power and rated altitude the Twin Wasp Junior engine is substantially equal to the single-row Hornet, this in spite of the fact that the piston displacement of the latter is the greater by 10 percent.

The higher permissible crankspeed of the two-row engine offsets not only the difference in displacement, but also the effect of a difference in brake mean effective pressure that at the moment is in favor of the single-row engine. It is to be expected, however, that the normal course of development will before long result in making the mean effective pressure of the two-row engine at least equal to that of the single-row, and possibly greater. Even under present conditions, the weight of the geared Twin Wasp Junior engine is a little less than that of the geared Hornet.

Early fears that good mixture distribution might be difficult to obtain in the two-row engine, or that its mechanical efficiency might be low, have not been realized; as a matter of fact, the result, both of dynamometer tests and of flight tests, have tended toward better specific fuel consumptions for the two-row engine than had previously been obtained with the single-row under corresponding conditions.

In common with internal combustion engines in other fields, the two-row radial aircraft engine exemplifies the improvements in operating characteristics which follow from an increase in the number of cylinders. One of these operating improvements is in general smoothness and freedom from vibration.

Thus, with the two-row engine the effects of repeated stresses on the airplane structure are minimized, with consequent diminution in maintenance difficulties and in the detrimental consequences of transmitted vibration. This last circumstance naturally means not only more comfort for the occupants of the airplane but also more reliable functioning of instruments and auxiliary equipment.

The fact that, as compared with the single-row engine, the two-row has more and smaller cylinders results in a second important advantage—that of a reduction in the stresses in the propeller that are produced by the explosion impulses. As these stresses are often the critical ones in determining the sizes of propeller parts, the result is that for a given engine power and propeller speed the weight of the propeller for the two-row engine may safely be less than that for the single-row engine.

There are already definite indications that, of two engines of equal power, the two-row has the better noise characteristics. This superiority seems to be due partly to the smaller cylinders, with resulting decrease in the energy of the individual exhausts, and partly to the higher frequency of the exhaust noise which makes it less objectionable in character.

It is not surprising that, at any rate for the present, the larger number of cylinders makes the two-row engine more expensive than the comparable single-row engine. The ratio of cost is now on the order of 14 to 9, but with increasing production it will undoubtedly become less. Here, however, it should be mentioned that the use of smaller cylinders and the smoother running characteristics of the two-row engine warrant the expectation both of a longer total life and of longer intervals between overhauls than in the case of the single-row engine, thus to some extent offsetting the differences in first cost and in the cost of individual overhauls.

In the servicing required from day to day, the difference between the single-row and the two-row engines is less than might be expected, chiefly because this servicing has consisted largely of valve gear lubrication, and the development of the automatically lubricated gear has diminished this item of labor so much, both for the single-row and for the two-row engines, that the difference in this respect between the two is relatively small.

When the development of large two-row engines was first undertaken, it was feared that it might prove very difficult to cool the rear cylinders adequately. Fortunately, however, the contemporaneous development of the "close" or "pressure" type of baffle so reduced the quantity of air required for cooling that it has become relatively easy to insure to the rear cylinders an adequate flow of air that has not been heated by contact with the front cylinders.

Another recent development in engine cooling, the controllable cowl, has made it possible to obtain an adequate total flow of air, even under difficult conditions, such as in climb, and at the same time to reduce both the air flow and the resulting drag under the easier cooling conditions of cruising.

The dimensional relations between the cylinders of single-row and those of the two-row engines tend toward inherently better cooling characteristics for the latter, since in relation to heat to be dissipated more cooling surface is available in the smaller cylinders than in the larger ones.

Although the overall length of the two-row engine is somewhat greater than that of the corresponding single-row, this disadvantage is much more than offset by a reduction in overall engine diameter, which, in a typical case, amounts to about 20 percent.; this corresponds to a reduction in frontal area of about 35 percent. Several favorable characteristics of the two-row engine are due to this small overall diameter.

One of the most apparent of these is the improvement in vision for the oc-

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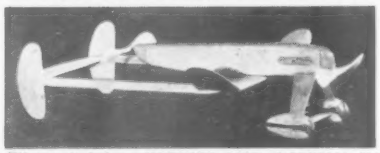

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This Complete LAWRENCE Kit even includes a MATCHED PAIR of SPECIAL MACHINE CUT PROPELLERS, Two Lubricated Motors of the Famous MRL Rubber, Fittings, Cement, SEMI-FINISHED WING, FULL SIZE PLANS, Etc., for ONLY 75c EACH P.P.

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cupants of the airplane, especially in single-engine machines; the benefits of this improved vision scarcely call for further discussion.

Another consequence of the smaller diameter of the two-row engine is a reduction in drag and, thanks to the improvements already mentioned in cowls and baffles, this improvement in engine drag characteristics does not have to be bought at a sacrifice in cooling characteristics. The effect of the reduction in engine drag on airplane performance naturally depends on the design of the airplane; it is greatest in fast machines of clean design, especially those with small fuselages or nacelles, and is least in airplanes of such design that engine drag constitutes a relatively small part of total drag.

A third beneficial effect of the reduced diameter of the two-row engine as compared with that of the single-row is an improvement in propulsive efficiency, assuming, of course, that both the single-row and the two-row engines have geared propellers. For a typical case, this improvement in propulsive efficiency amounts to about two percent., both at maximum speed and at cruising speed, thus diminishing by that amount the fuel required for a flight of given distance at a given airplane speed. Alternatively, the improvement in propulsive efficiency may be utilized to increase the maximum speed of the airplane.

An incidental advantage of the small diameter of the two-row engine is that it offsets the effect of the larger number of cylinders on the weight of cooling baffles and of exhaust collector, with the result that the combined weight of cowling, baffles and exhaust collector is no greater for the two-row engine than for the corresponding single-row.

In conclusion, it should be noted that comparisons between the two-row engine and a single-row engine of equal power do not tell the whole story, for the constant demand of recent years for increases in the power of aircraft engines has already brought the single-row engine to a point where the limitations imposed by increases in cylinder size and in brake mean effective pressures are close at hand.

This is recognized particularly on racing planes where we are approaching the limits of further increases with the present type of engines, for the complete modern plane now weighs less than the bare engine did a few years ago.

With the two-row engine, however, these limitations are still far enough away so that they do not operate as a serious restriction on engine development, and with the two-row engine it should be possible to continue for a considerable period to meet the requirements for higher powers without sacrificing the well-recognized advantages of the air-cooled radial that for so long have made it the dominant type among airplane power plants.

Variable Pitch

(*Continued from page 35*)

on the propeller performance at take-off and climb. The result of high airplane speed, in combination with geared motors, is to call for the use of unusually high-pitch angles.

These extremely high-pitch angles result in very inefficient operation of the propeller at the time of take-off, the action being somewhat similar to the inefficient flow over the airplane wings at angles beyond the stalling point.

The loss in propeller efficiency from very high pitch angles may be extremely great, sometimes amounting to more than one-third or even as much as one-half in extreme cases.

In planes of this type the use of a variable propeller is almost, or I had better say, is indispensable from the viewpoint of safety and performance, as the take-off of such planes without variable propellers is very hazardous.

The variable propeller again meets this condition in a satisfactory way, as the low-pitch setting can again be adjusted for take-off and the high-pitch setting for cruising.

In the case of modern transport and multi-motored planes the variable propeller is playing a deserving part. The performance of multi-motored planes with one or more idle engines is greatly improved by setting the propellers on the active engines in the low-pitch position so as to obtain full power.

A new and special application of the variable pitch propeller is now being tried out experimentally. In this type of propeller, the angle of the blades is controlled by means of a hydraulic governor so that a constant load or a constant speed can be maintained with the engines under varying flight conditions. An example of this propeller is shown by the accompanying illustration.

This not only permits of better flight economy in regard to the fuel consumpcontrol but it also greatly improves the tion. The hydraulic pressure is created by the engine and the fluid passes to pistons within the propeller hub.

In conclusion we find that the variable propeller will and is succeeding the fixed-pitch type in the commercial fields as well as the private owner's field.

END

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16" Flyers FAIRCHILD 22

Contains printed balsa parts, two colors tissue, wheels, wire, rubber, wood veneer, full-size plan dope, cement, etc., 8 models to choose from: **Goshawk, Fokker Triplane, Fokker D-1, Fairchild, Curtis Falcon, Howard Ike, Waco, Nieuport.** **30c** Ea. Postpaid

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With die-cast propeller, two bottles color, cement, printed balsa parts, etc. 10 models to choose from: **Douglass, Gee Bee, Fairchild 24, Bristol Fighter, Monocoupe, Spad, Aeronca, Boeing X P 936, Stinson, Flamingo.** **30c** Ea. Postpaid

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Laird Plane

(*Continued from page* 18)

the upper wing only. This alloy is also used for the trailing edge of the lower plane, starting behind the strut connection. Gasoline tanks are enclosed within both the upper and lower wing panels. It is notable that the interplane bracing is entirely of the strut type without the use of wires so that these struts handle both the flying and landing loads.

The tail surfaces are of the cantilever type, covered with a skin of 24ST alloy, the elevator and rudder hinges being fitted with ball bearings. The tail group is supported by a full swiveling tail wheel mounted on an oleo strut shock-absorber. All the tail surfaces as well as the roots of the wings are filleted into the fuselage at the point of attachment.

The Wasp "C" engine is rated at 450 h.p. at an elevation of 6,000 feet. It is covered with a fill N.A.C.A. housing.

SPECIFICATIONS

Length	27'-6"
Upper wing span	38'-0"
Lower wing span	17'-6"
Wing-loading	21.3 lbs./sq. ft.
Power-loading	11.9 lbs./hp
Gross weight	5,350 lbs.
Empty weight	3,205 lbs.
Payload	1,170 lbs.

END.

Movies

(*Continued from page* 10)

feels terribly about this; but his son claims he can't fly in the Army maneuvers—he hasn't the nerve to go up to drop flares.

On the night of the maneuvers, Little Mike is with Dare. Suddenly Skip comes in and tells Mike that he owes it to Phil and to his father not to quit. They walk outside and Mike sees Big Mike flying in a flimsy crate, dropping flares.

The son dashes to the airport and gets into his ship. He tries to get his father to land before the old plane falls apart. One of the wings gives and the ship hurtles into a lake, a burning mass. Risking his life, Little Mike drags his father to safety. He knows now that he isn't yellow, after all, and that he *can* fly.

This is demonstrated to the satisfaction of everyone who can view the stunting and flying that is shown.

Big Mike is reinstated through the efforts of General Carter and he is the one to pin the wings on Little Mike. Then, like all Hollywood epics, the juveniles are happily reunited. As they hold the final embrace, hundreds of airplanes fly past in a stupendous, monstrous, gigantic, colossal, and mediocre aerial review.

END.

Lake-Front

(*Continued from page* 14)

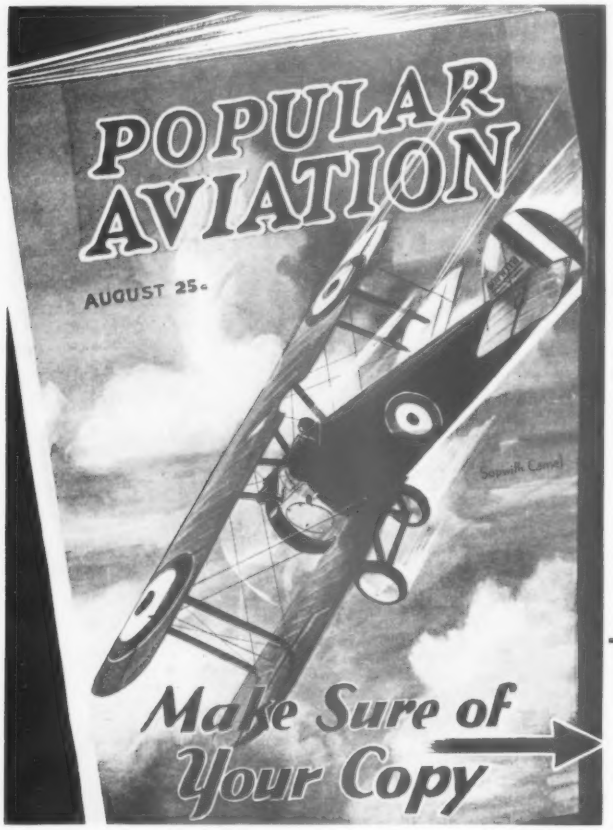
for commercial purposes. I remember having had the pleasure of flying for the Government back in the year of 1919, at which time Grant Park was used for a landing field; and although we had no serious accidents, the location of the field was not practical.

"Except on days when we had winds from the East, flying conditions were very bad; visibility was very poor because of smoke and mist. Take-off's toward the loop were almost always considered dangerous; of course, planes are much higher powered these days, which would make it a lot safer.

"As I understand the proposed island airport construction, the West boundary of the field will be just one mile from Michigan Avenue. This means that the modern commercial transport plane taking off at 100 M.P.H. would be over the loop area within 45 seconds after the wheels lifted from the runway. Should any trouble develop in that first minute, it would be almost impossible to make a safe landing; of course, we must admit the same conditions prevail at the present Municipal Airport when planes take off toward an Easterly direction."

* * *

No. 5 (Official and Pilot, a man without a doubt who knows more than any other official or pilot in this area



The AUGUST Issue

NEW READERS and old readers alike, will find much of interest in the August issue of POPULAR AVIATION, on the front cover, rear cover and between covers. We have some articles treating on some brand-new subjects that will hold their interest and attention.

Our Photo Phans will find a lot of dope on the Sopwith Camel, that wartime celebrity, starting with a full colored picture on the front cover and then following through to an interesting description of this noble little ship on the inside pages. There will be some rare photos accompanying the article which will be of interest.

Then, there will be a highly instructive article on the merits and demerits of the two-cycle engine, an engine type that is now being seriously considered by the aviation industry. There will be a lot of instructive matter on lightplane construction and design, an instructive flight story and much new data in the old departments which have proved so popular in the past. You must get your copy of the August issue and the surest way is to subscribe.

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in regard to this question) "I am not for the lake-front airport, but neither am I against it. I only hope that whatever is going to be done about it, will be done in the very near future.

"Without a doubt there are only two ways to improve the present local conditions. One is to construct the island airport as proposed, the other is to construct a super-highway from the present airport to the loop. Either one, I am sure, would prove satisfactory and save much time.

"I have it from good authority that two of the airlines now housed on Chicago's Municipal Airport are ready to spend upward of $250,000 in improving their present buildings and constructing additional hangers, however, none of this money will be spent until it is definitely decided whether or not the local aviation activities are to be transplanted to the lake-front.

"Not so long ago the city secured from the school board, a plot of land located just to the North of the present airport site. It was planned at that time to lengthen two of the runways and move the administration building to a spot near Fifty-fifth street. This would actually bring the boundary of the present airport one mile closer to the loop.

"None of the large airlines operating from the present field, fly directly across the lake as would no doubt be the case if they were to use the proposed landing field. I believe an airport in Chicago's front yard would be very nice for the use of private operators and sportsmen flyers and perhaps as an emergency field; but as for the airlines, it would only mean an additional landing and take-off, for as the question now stands these operators would maintain their present quarters for maintenance and storage."

* * *

No. 6 (Official) "Chicago needs an airport close to the business district. I am for it 100 per cent and believe every other official should feel the same way. An appropriation should be made at once for the construction of our lake-front airport, the building of which would give employment to thousands of our local citizens.

"In spite of all that has been said against the proposed project, I do not believe there is anyone who could give me three good reasons why it should not be built. Mayor Kelly is surely doing the right thing in asking for a Federal loan to construct this field and every Chicago citizen should give him their support."

* * *

No. 7 (Pilot) "A landing field in Chicago's front yard is like a dream. Almost every time I fly over Chicago's sky-line I picture a landing field within five or ten minutes walk of the busiest corner in the World, State and Madison Street. I am sure that if every Chicago citizen had the opportunity of flying along above Michigan Avenue, they would vote 100 per cent for the airport."

* * *

No. 8 (Official) "I do not know a H--l of a lot about it but as I look at the question, it seems to be the saving of time on mail delivery to the business district. If this is the big problem I see no reason why the large transport companies could not add a few amphibians to their fleet for the carrying of mail to and from the city's present Municipal airport. This method could also be used in carrying passengers who had intentions of visiting the loop."

* * *

I, as the author of this article, and POPULAR AVIATION Publishers are strictly neutral on the question of the lake-front airport. I must admit that I was very much surprised at the outcome of the above interviews which were all made at the Municipal airport and are authentic. Personally, I feel the same as many of those I questioned, what ever is going to be done should be done as soon as possible and not prolonged. Without a doubt such a project would be a great help to the city. The question of whether or not it would be practical will only be proven by time.

END

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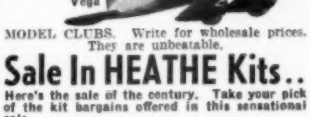

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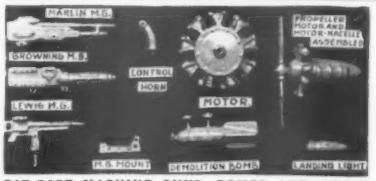

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TINYTONE RADIO CO. Dept. P. A. Kearney, Nebr.

CLASSIFIED

AIRPLANE MFGS. AVIATORS, MODEL FIRMS, have your models built by an expert model builder, who has built scale models for Major Seversky, Comm. Zelcer, Lieut. Levy, etc. —10 yrs. experience designing, teaching, offers services anywhere.—Anthony J. Tridico, 2604 Bedford Ave., Brooklyn, New York.

YOUNG MEN wanted to help organize Aviation Club. Information write, New York Flying Squadron, 153 W. 21st St. New York.

FOR SALE: 45 H.P. SR-3-0 Szekely engine completely rebuilt, late type crank case. Total time 160 Hr. Parts from Bull pup in first class condition. Instruments and panel, Johnson air speed, tail skid and rudder, all controls and stick, Dural motor mount, 16x7 air wheels and hubs complete, landing gear slightly damaged. Priced for quick sale on entire lot $175. Stock of miscellaneous Szekely engine parts at close out prices.—Hambrick Electric Co., Fort Worth, Texas.

QUIT TOBACCO easily, inexpensively. Send address.—Major Stokes, Mohawk, Florida.

YOUNG MAN, 21, desires connection with reliable flying service, airport or aviator. Services in exchange for flying course. Board and room. —John Wasilensky, 4444 Ewers St., Detroit, Michigan.

BEAUTIFUL 16-inch All Silk Parachutes. Drop from model plane or kite, 40c postpaid. We buy and sell used model plane motors. Information 10c refunded on first order. Blackburn-Miles Aircraft, Burlington, Wis.

FOR SALE

GREAT LAKES Trainair from World's Fair. Used for amusement and Pilot trainer. Run by 10 horsepower electric motor. This $1800.00 machine complete for best offer.—John T. Lynch, 6242 S. Whipple St., Chicago, Illinois.

HUNDREDS OF AIRPLANES, $40 up. Motors, parachutes, crackups. Directory 20c postpaid with descriptions, owner's price, name and address. Used Aircraft Directory, Athens, Ohio.

WHITE GABARDINE helmets 85c pp, shatterproof Resistal goggles, $2.90. Many others.—Anderson, 106 Cook, Ithaca, N. Y.

PLANS and parts for Lightplanes, Midget Racers. Engines, wheels, propellers, hubs. Circulars 10c.—Storms Aviation Co., 13 Southside, Asheville, N. C.

BARTER and EXCHANGE

Notices in these columns are exclusively for trades. Cash sale advertising must be inserted in the Directory or under classified advertising. Notices in the Barter and Exchange column, three cents per word.

AIRPLANES

EAGLEROCK—Trade for car or $190; Robin, trade for car. OX-Bird for aircooled. List of almost 300 others, 20c.—C. J. Dry, Box 456, Athens, Ohio.

FOR SALE OR TRADE—Primary Glider Complete. Factory job. Valued at $50. What have you?—H. G. Harper, Carthage, Mo.

ANZANI 60 h.p., 6 cyl. aircooled, radial motor complete with motor mount for Pietenpol, less prop.—J. W. Rogers, Roundup, Mont.

BURNISHED gold alto saxophone, new, in plush lined case, three hundred twenty dollars. Metal Boehm clarinet in case, seventy-five dollars. Trade both for plane. Add cash if warranted.—Box 122, Osceola, Mo.

TRADE—Waco Glider needing little work, have extra set of wings, tail surfaces, and trailer to haul glider.—L. F. Clemenson, 480 Edith Ave., Johnstown, Pa.

WANTED—OX Eaglerock — Travelair — Robin Bird or similar plane. Consider light radial job needing repairs or lowering. Tell full particulars in letter. Eaglerock and standard parts for sale or trade, also some wing struts and tail surfaces for Challenger Robin.—Peter Bryn, Hannaford, N. Dak.

LATE 1932 Model R Studebaker light coupe, driven less than 14,000 mi. Has free wheeling, floating power, syncro mesh transmission, automatic starter, in fact everything cost $1185 two years ago. Runs and looks like new. I want a good two or three place light plane licensed or eligible for license. No crack up or home built affairs considered. — Cliff Plegge, Searcy, Arkansas.

MEAD PRIMARY with welded controls, Freese type ailerons, large rudder, 1500 feet of rope and trailer all in good condition. Will sell for $60.00 or trade for parts for an OX5 ship.—Geo. Swede, 25 Ter Hune Ave., Lodi, N. J.

FOR SALE OR EXCHANGE—Cheap, Waco 10. Recovered, motor overhauled, Gruss aero struts 30x5 wheels, compass, airspeed, can be licensed with little expense. State your deal.—L. P. Kowalki, Wall Lake, Iowa.

SWAP.—Retz R 4 High lift monoplane. 2 place dual controls, complete with Ford B motor. Complete with mag. prop and Hup. Radiator motor ran 6½ hours. Send for photo. Will take car or motorcycle or $175.00 cash.—Ferris Finnerty, Twining, Mich.

MOTORS, ENGINES, PARTS

AIRCAMPER fuselage, tail, and wheels; Heath wings. Others. List.—Frank Earles, Hayes, S. Dak.

CLASSIFIED—(Continued)

PHOTOGRAPHS—Aviators, Planes. Celebrities. Scenic. All sizes. Sample and price list, 10c. —Ralston Photos, 612 No. Denny, Indianapolis, Ind.

WANTED: T. M. Scout Fuselage. No rust.—Box 119, LaFayette, Calif.

CANADIANS try us for aeroplane supplies, converted motors, spruce plywood, etc. Price list, 5c.—Hoyt's Aviation Supplies, Midland, Ontario.

MODEL AIRPLANE Supplies and Kits. Complete line of Construct-A-Plane. Scientific G. H. Q. Selley's Ideal, Berkeley's & Sky Craft. Boat models and Scene-O-Craft Kits.—Henn, 93-36 43rd Ave., Elmhurst, N. Y.

TRADE. '27 Harley 74. One new tire, two tubes, and battery. A-1 shape. '25 Dodge sport roadster, new 12 volt battery. 32 Caliber 5 shot U. S. revolver. Harley 61 motor and transmission. Motor-generator battery charger, direct coupled, mounted on steel rack. Midget auto with Briggs & Stratton 4 cycle motor. A. K. 42 Radio. Want licensed airplane or late model Indian "4."

Will trade valuable inventions unpatented of my own for use on motorcycles and new design in 5c school pencil writing tablet. Send references in first letter. Want new motorcycle, automobile, and airplane.—Jerry de Nicola, Linco Service Station, 450 Commercial St., Mingo Junction, Ohio.

WILL SELL OR TRADE—Aviation course, twenty Heath ribs, want air camper parts.—Frank Hamata, Agnew, Nebr.

WANT bicycle motor will give $5.00.—Julus Taurel, 317 Tallman St., Syracuse, N. Y.

HAVE one place racing plane unfinished. Steel welded fuselage, with tail and wings as adjustable stabilizer, streamline landing gear with oleo and wheel. Need covering and engine. Uses Kinner 125 horsepower.—C. DiGivia, 16 Westfield St., West Haven, Conn.

WANTED OR TRADE—Aeronaca, Cirrus, Velie, Wright Gipsy, LeBlond, Cross Country Twin or any motor weighing between 150-300 pounds complete. Must develop 40 H.P. and over. Consider crack-ups with same. Bottom prices in first letter.—Oalo Depew, Alpine, N. Y.

SALE OR TRADE—Used airwheels 13x5x4" and 16x7x3" with tubes. Used instruments—compasses, airspeed indicators, altimeters, assorted lengths of square drag wire, also turnbuckles, cheap.—L. C. Houston, 144 Fairbanks Ave., San Antonio, Texas.

WANTED—Lightplane fuselage steel, trade rifle, etc.—Harold Hoover, Glasgow, Ky.

WILL TRADE 28 HP Lawrence Aero engine in good running condition complete with prop and motor mount for Heath. One pair 18x3 wheels, tires, tubes, and streamlines in good condition. Also one Hickman tachometer drive for Lawrence. Want Chute, or what have you? Have cash or trade for cylinders and heads for Szekely SR3.—E. L. Bogut, 1316 Fourth St., Havre, Mont.

PROPELLER WANTED, pitch must be about five feet, diameter near six feet 6 inches. Will pay cash.—W. A. Morrell, 1012 Jean Talon St., W., Montreal, Canada.

MISCELLANEOUS

IN EXCHANGE for aviation course in any reputable school, young man, aged 22 and having high school education, will obligate himself to firm or individual for reasonable length of time as pilot or mechanic.—Clifton Speer, Box 864, Corpus Christi, Texas.

WILL work for aviation mechanics or flight training. Age seventeen.—Paul Volgamore, McPherson, Kansas.

YOUNG MAN, 21, very much interested in aviation would like to get job doing anything from working around planes to parachute jumping. High school education, energetic, clean, sober, ambitious. Am now employed as an auto mech. in my father's garage where I have been working for five years. Will work for living wages or room and board. Won't someone please help me get started in the game that has held my interest for years. Please write to W. B. Fisher, Jr., 1609 Center St., Des Moines, Iowa.

Back Numbers

Many of our readers, interested in the subject of insignia, have missed the insignia previously published on the back-covers of the February and March, 1935, issues. Send for these back numbers and complete your insignia collection.

Again, if you have missed any of the data sheets, tell us what numbers you require and we will send you the issues in which they appear. Back numbers will be mailed for 50 cents each.

POPULAR AVIATION
608 S. Dearborn St., Chicago, Ill.

XUM

High-Lights

(*Continued from page 32*)

planes between San Diego and Los Angeles fly at altitudes of odd numbered thousands of feet and southbound planes at even numbered altitudes because of congested traffic. . . . Grant said the next busiest air lane is between Chicago and New York.

* * *

ACCORDING to some friends of Wiley Post, a sore nose may have cost the famous Oklahoman $200,000 in contracts as a result of being forced down on his third stratosphere flight attempt at Lafayette, Ind. . . . An oxygen valve started pouring oxygen into Wiley's pressure suit faster than the release valve could carry it away, resulting in the wind shield in his headpiece becoming fogged and in order to see Post had to stretch out and wipe the moisture off with his nose, which soon began to feel the wear and tear. . . . Post, who has announced his intentions of entering the movies, may retire his famous plane, the Winnie Mae, from further transcontinental speed attempts.

* * *

D. W. TOMLINSON, vice president of Transcontinental and Western Air and author of the article entitled "Up Gear and Down Gear With the Air Line Pilots," which appeared in the June issue of POPULAR AVIATION, accompanied by Copilot Hal Sneed and Radio Operator Pete Redpath, flew the TWA mystery transport plane to a new transcontinental record, completing a flight from Los Angeles to Floyd Bennett Field in 11 hours and 5 minutes. . . . Eight further speed tests are being planned for the mystery plane, which is equipped with a robot.

* * *

AIDED by a tail wind, Pilot Paul Reeder of United Air Lines recently flew from Newark to Cleveland with eight passengers in two hours and nineteen minutes and Frank Marton piloted the plane with seven passengers from Cleveland to Chicago in one hour and thirty-three minutes, forty-three minutes ahead of schedule.

* * *

CLIPPER FLIGHTS: As indicated here some time ago, Col. Charles A. Lindbergh will command the Pan-American Airways first regular clipper run from California to China, flying the trail-blazing seaplane, Pioneer, in which Capt. Edwin C. Musick recently completed the first aerial round trip between California and Hawaii, establishing a new mark of 17 hours and 45 minutes for the westbound crossing. . . . Accompanying Musick, R. O. D. Sullivan, first pilot, Victor A. Wright, engineering officer; Harry R. Canaday, junior flight officer; W. Turner Jarboe, Jr., radio officer, and Fred J. Noonan, navigation officer, who made the trip to Hawaii twelve years before spending SEVENTEEN days aboard a barkentine.

P. A. A.'s experimental transoceanic plane is the fourteenth aircraft to complete the flight between the mainland and the Hawaiian Islands, the first flyers being Lieutenants Maitland and Hegenberger, who made the hop from Oakland airport to Wheeler Field, Honolulu, in 1927 to be followed by Ernie Smith and Emory Bronte. Next came the Dole race, which was won by Art Goebel and William Davis with Martin Jensen and Paul Schluter as the only others to finish.

* * *

CAPT. Kingsford-Smith arrived in 1928 and took off from Kauai Island with the Southern Cross on its trip to the South Seas and Australia and in January, 1934, Lieut. Commander Knefler McGinnis led six Navy planes to a new mass formation nonstop record from San Francisco to Pearl Harbor. . . . Last November Kingsford-Smith and Captain P. G. Taylor made the first flight from the Islands to the States, which was duplicated by Amelia Earhart in January of this year.

* * *

DAVE BEHNCKE, president of the Air Line Pilots Association, has recommended J. H. "Slim" Carmichael, pilot for the Central Airlines, for the Air Mail Medal of Honor in recognition of his feat of safely landing his passengers and cargo after losing a motor and disabling his landing gear during a late night after leaving Washington en route to Detroit. . . . R. H. "Bat" Taylor was copilot.

* * *

Believe it or not, this is EGGSACTLY what happened, according to Walter Brooke, who has just completed a flight over the South American jungles and is returning as a mail pilot for the American Airlines. . . . It seems that when the Colombian government established an air line from Bogota to Puerto Carreno, on the Orinoco River, the planes crossed a desolate region inhabited by savage tribes, who after seeing their first transport plane decided to trace the BIG BIRD to its nest in order to get some eggs for hatching purposes. . . . Several of the Indians were caught attempting to break into the hangar while looking for "the big bird's eggs."

* * *

PLANS are under way calling for 1,000 military planes to take part in the greatest massed flight that San Diego has ever witnessed which will be staged during the California Pacific International exposition beginning May 29 and continuing to November 11.

* * *

HUGHES BUCKINGHAM, British aviator, claims a new record of 59 minutes for the 225 mile flight from Croydon Airdrome to Le Bouget, which would be all very nice, except as I recall it, Frank Hawks has winged the distance in 51 minutes.

END.

Aero-Sportswoman

(*Continued from page 28*)

the respect and admiration of all who knew him, and his loss will be felt keenly in the industry.

The way he worked out the details of this new plan is an example of his keen perception and sincere effort to build a firm foundation for his business. In preparation for it, he kept a meticulous daily record of the weather conditions over a period of several years; he worked out the average flying-time during each month of the year on a percentage basis; and he computed the actual cost of operation on his ships, including flight instruction, the maintenance, depreciation and insurance.

The new plan of operation was put into effect at the Stinson airport, the first of December last year. Some thirty students have been enrolled in the organization, and we are happy to report, that Bill's associates are "carrying on" with a fine spirit of loyalty and a sincere enthusiasm to prove his theory that aviation can be developed on a low cost basis.

Briefly the plan is to allow the student an unlimited amount of flying time at actual cost, in licensed airplanes, under the supervision of licensed transport pilots, subject to the following conditions:

1. The subscriber shall pay the company the sum of $65 as an annual fee for the privilege of participating in the plan.

2. The subscriber agrees to pay for a minimum of four hours of flying time the first of each month, the rate per hour to be determined by the actual cost per flying hour of the preceding month.

In the event that the subscriber does not fly the four hours during any one month, credit will be allowed and the accumulated hours may be used at anytime during the life of the contract. Thus the student is protected from losing any of his time, and the company is assured of a regular income. There are, of course, necessary regulations about limiting the time each student may fly on Saturdays and Sundays, so as to allow all a fair chance. Also, the company, by its duly authorized representative, reserves the right to judge the matter pertaining to flying conditions, weather, ability, fitness and experience required for the type of flying desired.

There are two ships available for the use of the students at present, a Waco F, and a new model of the Aeronca. The average cost during the five months that the plan has been in operation, has been about $7.50 per hour on the Waco and $3.70 on the Aeronca. And with the increased flying during the spring and summer months, the company is confident that they can reduce even these figures.

END.

Gay 90's

(*Continued from page 22*)

power. It was totally wrecked in July of the same year, without having made a successful flight.

Fig. 7 shows the first modern looking cabin ship. It was the 1912 creation of A. V. Roe, whose "Avro" planes are well known today. Mr. Roe designed and built the first successful heavier-than-air machine built by a British subject, back in 1907. The plane in which we are interested was a double bay biplane of equal span. The tail surfaces were well formed, a balanced rudder without fin being used. It was powered by a sixty horsepower Green motor. The landing gear consisted of two disc wheels and a single skid central between them. Wing tip skids were also employed. Data on its specifications and performance are not available.

But of all the early airplanes, the one which was made modern in principle and general design, the one which would not look out of place on a *modern* field, was the "Antoinette Monobloc." This remarkable ship, shown in Fig. 8, shows how painfully slow is the development of the airplane, when we must return to 1911 for the design of our best ships. The plane was designed and built in 1911 for the French Military Trials.

It had an overall length of thirty-eight feet and a span of fifty-two feet. The total wing area was 597 square feet. The weight, empty, was 1,874 pounds and with full military load, such as it was then, was 2,866 pounds. It was powered with a sixty horsepower Antoinette motor. The plane carried a pilot and observer seated in tandem.

An examination of the plans will disclose that it had an inverted inline motor such as is again finding favor in such ships as Benny Howard's racers and which, I believe, is the most aerodynamically efficient type. The ship also boasted cantilever wing and advanced wheel streamlining. I have inserted a sketch of the Alexander "Bullet," a modern cabin ship along the same lines as this early creation.

You will note in most of the planes that we have discussed, the engines developed only about fifty horsepower. When you consider that most modern planes use engines developing 125 horsepower at the least, you cannot deny that the early designers did their best with what they had.

An interesting comparison can be drawn between the 1912 "Supermarine" flying boat and the new "Stinson Reliant." They both used 225 horsepower engines, the one to drive double props and the other a single one. The gross weight of the "Supermarine" was 3,950 pounds, with a useful load of 950 pounds. The gross weight of the "Stinson" is 3,225 with a useful load of 1,075 pounds, only 125 pounds better than that of the flying boat.

This gives the "Supermarine" a power loading of about 17.6 pounds per horsepower as compared with the "Reliant's" loading of only 14.3 pounds per horsepower. The "Supermarine's" speed of seventy m.p.h. is almost doubled by the "Stinson Reliant." Nevertheless, in spite of the increase in speed, due to streamlining and lighter power loading, there is not much to show for twenty years of aviation development. Yessir, you must admit that aviation's pioneers knew their stuff and were pretty "cagey," aerodynamically speaking. If we make as much progress in the next ten years as we did between 1909 and 1919, we should be satisfied.

END.

Liberty Engines

(*Continued from page 19*)

Up to a very few years ago, the "Liberty 12A" was used as standard equipment in the majority of the observation and cargo planes of the U. S. Army and saw many millions of miles of service. Even today, the many Douglas O-2's and BT-1's are giving excellent service in Reserve and National Guard units throughout the United States with the same old faithful "Liberty 12" as was designed 17 years ago. There are many of the old kickers in Europe today where they have done service since the war. END.

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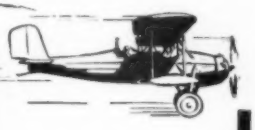

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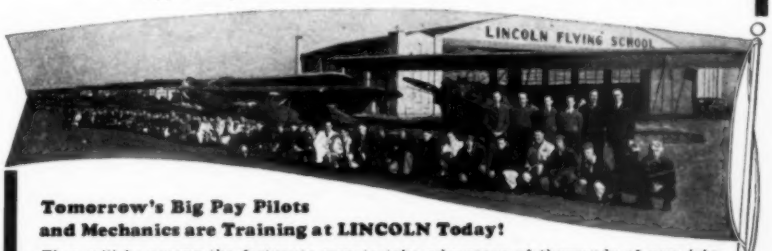

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